Infrastructure Master Plan 2021
2021/2022 – 2051-2052

Volume 4:
South Coast System

UMGENI WATER · AMANZI

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UMGENI WATER

INFRASTRUCTURE MASTER PLAN 2021

2021/2022 – 2051/2052

JUNE 2021

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PREFACE

This Infrastructure Master Plan 2021 describes:

- Umgeni Water's infrastructure plans for the financial period 2021/2022 – 2051/2052, and
- Infrastructure master plans for other areas outside of Umgeni 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 2020.

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

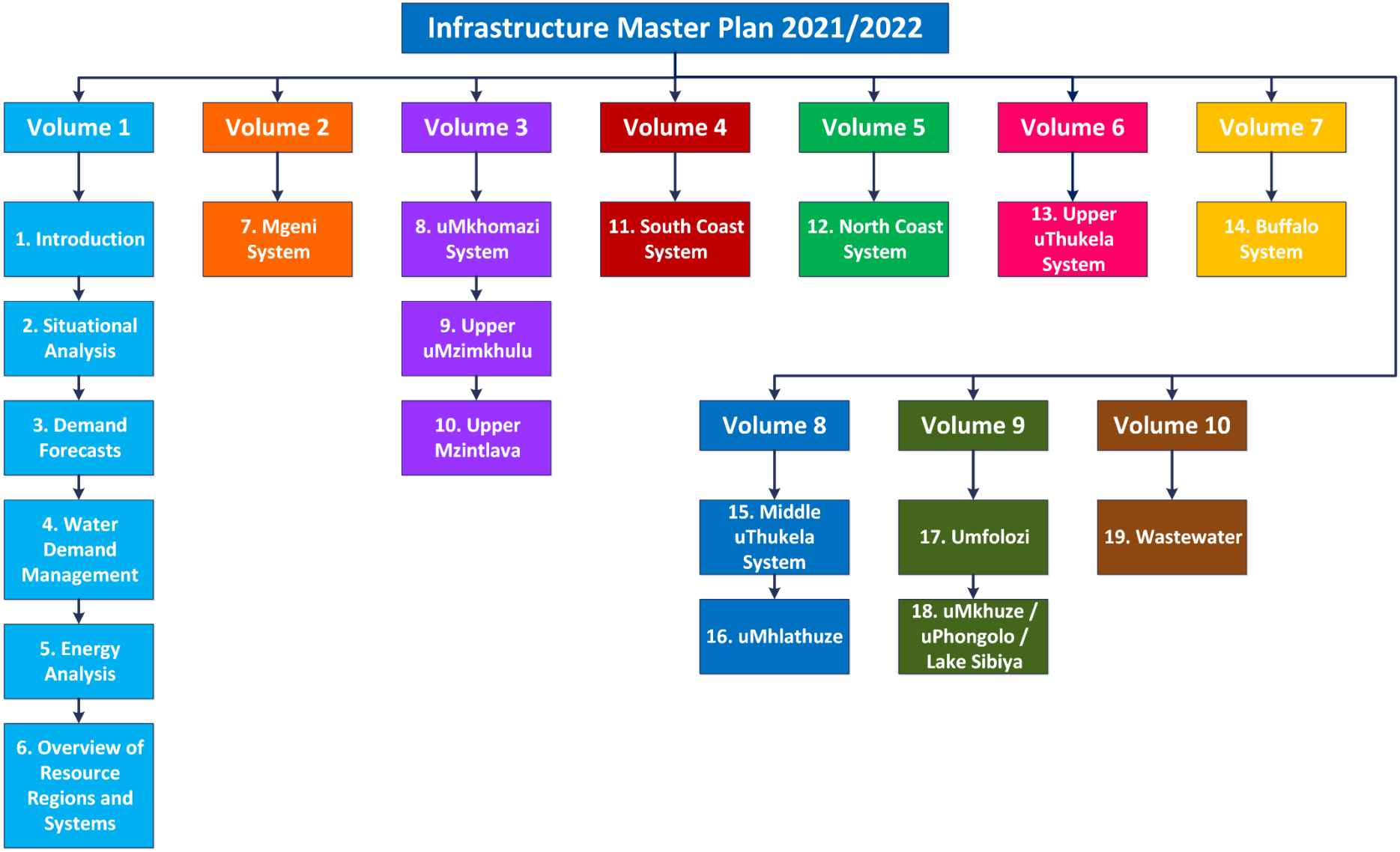
Volume 1 includes the following sections and a description of each is provided below:

- **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 Umgeni Water Operational Areas and provides a review of historic water sales against past projections, as well as Umgeni Water's most recent water demand projections, compiled at the end of 2020.
- **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 Umgeni 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**	Mgeni 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 Umgeni 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 Umgeni Water are also described in this section.


Infrastructure Master Plan 2021/2022
Volume 1
1. Introduction
2. Situational Analysis
3. Demand Forecasts
4. Water Demand Management
5. Energy Analysis
6. Overview of Resource Regions and Systems
Volume 2
7. Mgeni System
Volume 3
8. uMkhomazi System
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15. Middle uThukela System
16. uMhlathuze
Volume 9
17. Umfolozi
18. uMkhuze / uPhongolo / Lake Sibiya
Volume 10
19. Wastewater

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 Umgeni 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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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-Mgeni Transfer Scheme
MMTS-1	Mooi-Mgeni Transfer Scheme Phase 1
MMTS-2	Mooi-Mgeni 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
UW	Umgeni 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:

Umgeni Water, 2021. *Umgeni Water Infrastructure Master Plan 2021/2022 – 2051/52, Vol 1 - 10*. Prepared by Planning Services, June 2021.

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

11. SOUTH COAST SYSTEM

11.1 Synopsis of South Coast System

The South Coast System comprises three sub-systems, viz.

- The Upper South Coast, which extends from Amanzimtoti to the uMkhomazi River;
- The Middle South Coast, which extends from the uMkhomazi River to the Mtwalume River (just north of Hibberdene); and
- The Lower South Coast, which extends from the Mtwalume River to the Mtamvuna River (Port Edward).

As shown in **Figure 11.1**, the Upper South Coast is located in eThekwini Municipality and the Mlazi/Lovu and uMkhomazi Water Resource Regions. The Middle South Coast includes the southern-most portion of eThekwini Municipality, Umdoni Municipality and the Middle South Coast Water Resource Region. The Lower South Coast includes the southern-most portion of Umdoni Municipality, Umzumbe Municipality, Ray Nkonyeni Municipality, the Mzimkhulu and Mtamvuna Water Resource Regions.

Umgeni Water currently only operates in the Upper and Middle South Coast sub-systems, and supplies bulk treated water to the southern parts of eThekwini Municipality and to the northern parts of Ugu District Municipality. Bulk water infrastructure is located primarily within the coastal strip, with some pipelines extending into adjacent rural areas, as shown in **Figure 11.1**. The bulk infrastructure is either owned by Umgeni Water, eThekwini Municipality, Ugu District Municipality, or is privately owned by Sappi Saiccor. **Figure 11.2** shows a schematic layout of the Upper and Middle South Coast Supply Network and is represented spatially in **Figure 11.3**.

In addition to being located in the Mlazi/Lovu, uMkhomazi, and Middle South Coast Water Resource Regions, the Upper and Middle South Coast sub-systems rely heavily on the Lower Mgeni System (**Section 7.6 in Volume 2**). Water from Inanda Dam is treated at Wiggins Water Treatment Plant (WTP) and potable water is supplied via the South Coast Augmentation (SCA) Pipeline to the Amanzimtoti WTP.

Phase 1 of the SCA Pipeline was constructed by Umgeni Water in 1994 and transferred to eThekwini Municipality in 1997. The Phase 2 upgrade of the SCA pipeline was carried out by eThekwini Municipality in 2005. The SCA Pipeline is now wholly-owned and operated by eThekwini Municipality. Treated water is sold by Umgeni Water "at the fence" at Wiggins WTP, and there is a "buy-back" arrangement at Amanzimtoti WTP for the water required by Umgeni Water for the South Coast areas.

The design capacity of the SCA in-line booster pump station is 97 Mℓ/day. This is adequate to augment the shortfall in supply from the Nungwane Dam, as well as limited treatment capacity at Amanzimtoti WTP. Wiggins WTP (Central Region, Mgeni System) via the SCA pipeline is used to augment potable water sales at Amanzimtoti WTP. As a result, Amanzimtoti WTP operates as both a WTP and a bulk distribution node for the Upper and Middle South Coast sub-regions via the South Coast Pipeline (SCP).

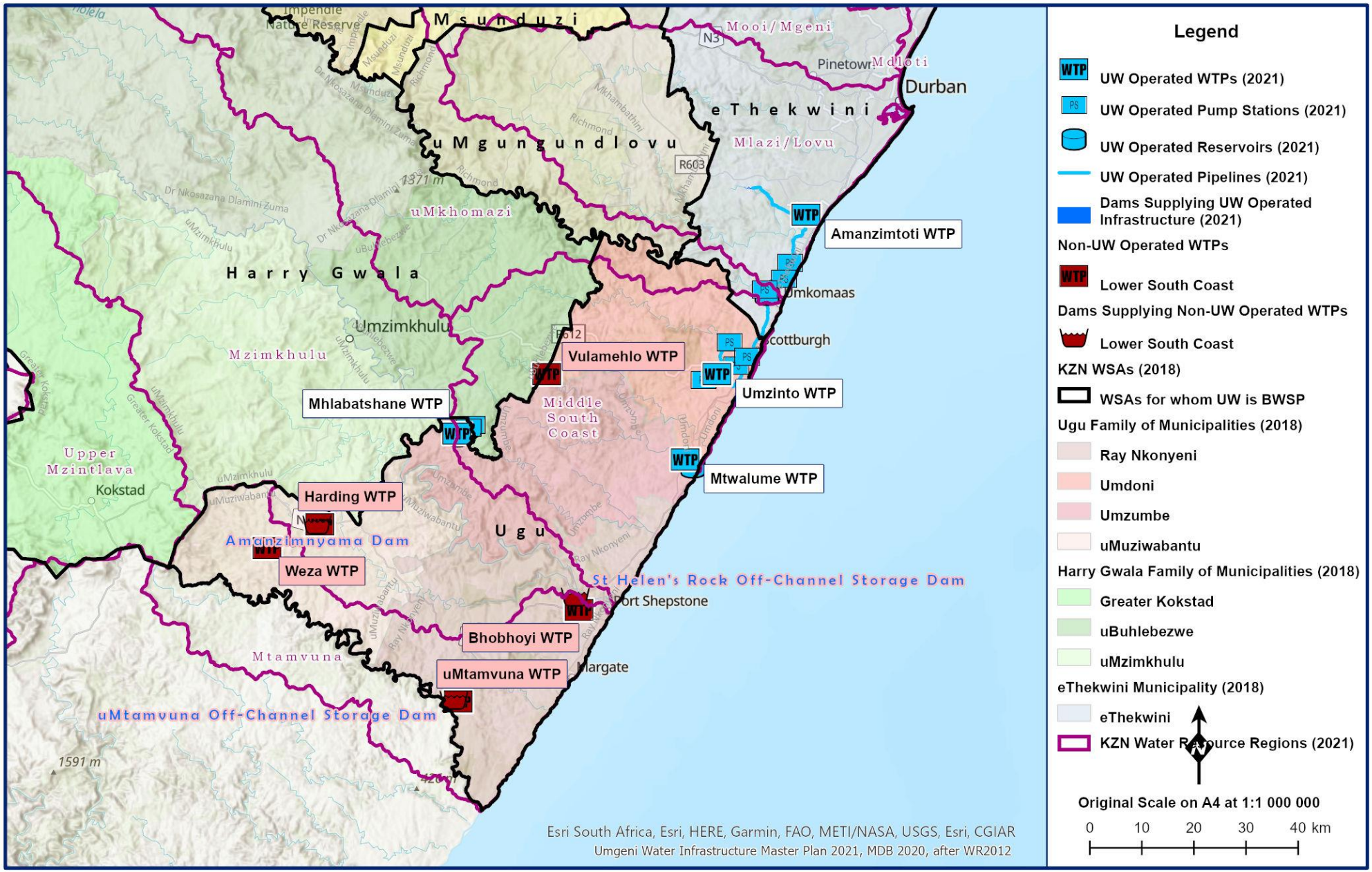


Figure 11.1 General layout of the South Coast System.

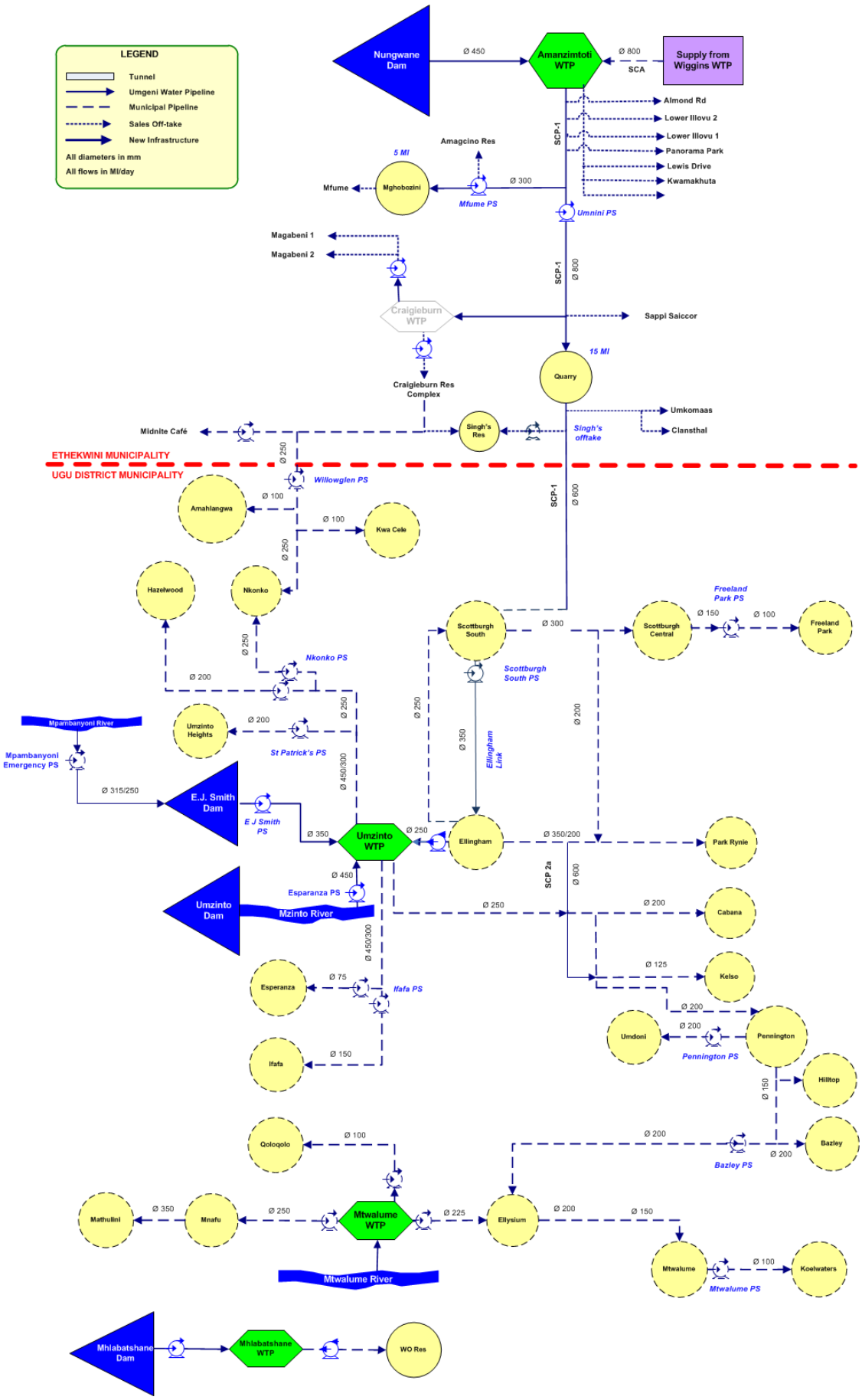


Figure 11.2 Schematic of the South Coast System (including Ugu District Municipality bulk supply infrastructure).

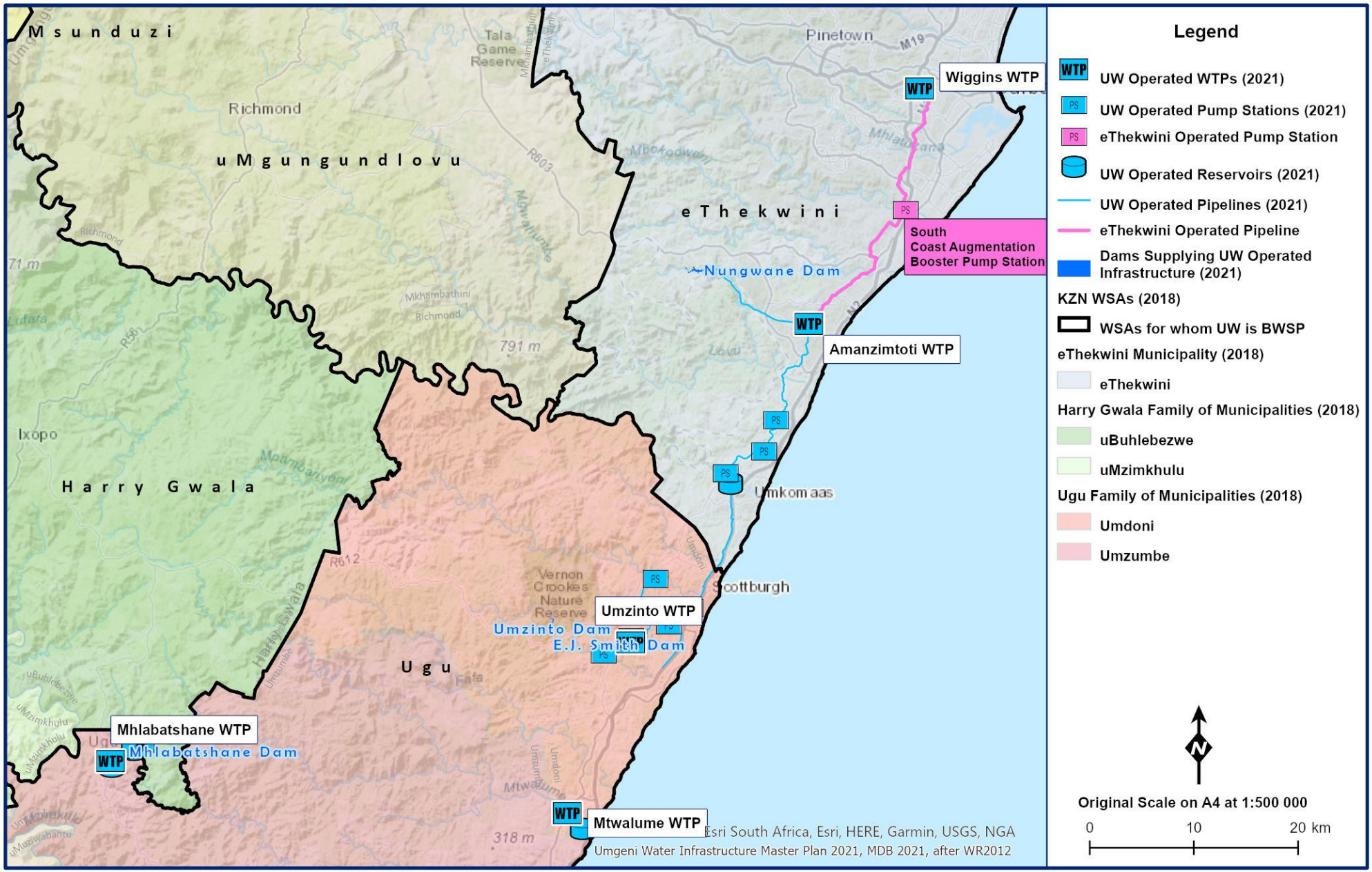


Figure 11.3 Middle South Coast Region.

The Lower South Coast sub-system relies heavily on the uMzimkhulu and uMtamvuna Water Resource Region, with the bulk infrastructure being owned and operated by Ugu District Municipality. **Figure 11.4** shows a schematic layout of the Lower South Coast Supply Network and is represented spatially in **Figure 11.5**.

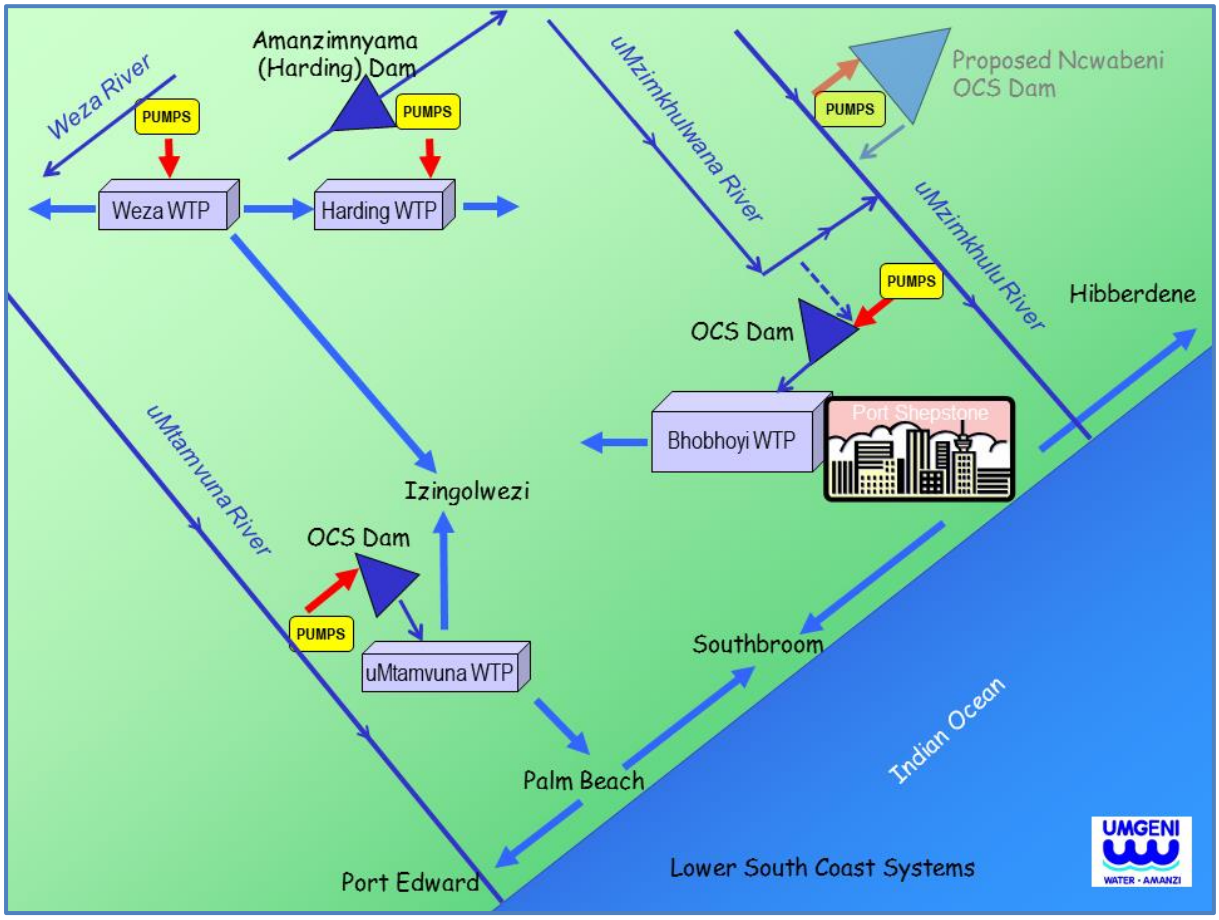


Figure 11.4 **Schematic of the Lower South Coast System (including Ugu District Municipality bulk supply infrastructure).**

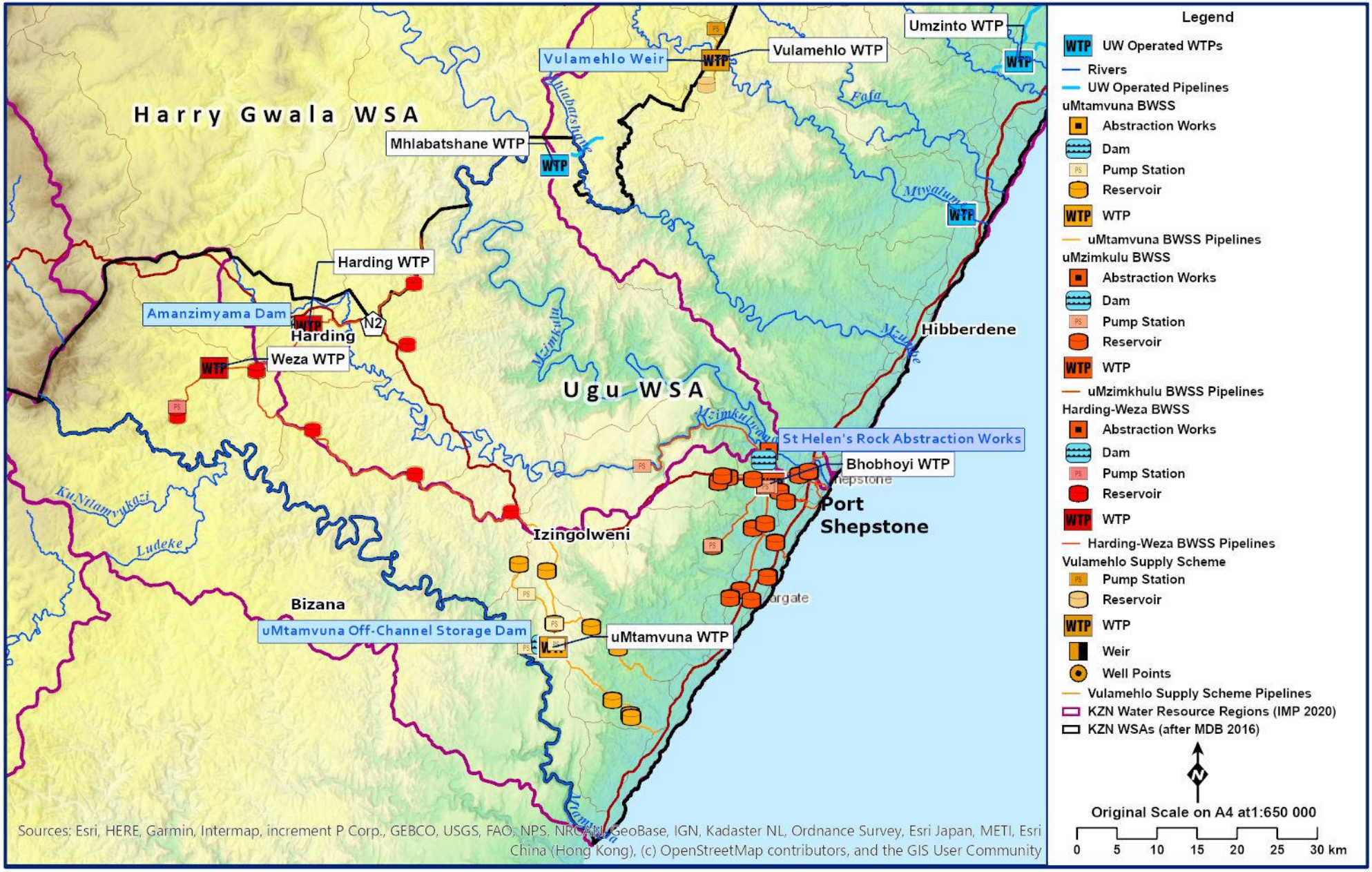


Figure 11.5 Lower South Coast Region.

11.2 Water Resources of the South Coast System

11.2.1 Description of the Water Resources

(a) Mlazi/Lovu Region

(i) Overview

This region comprises two tertiary catchments U60 (uMlaza River) and U70 (Lovu River) (**Figure 11.6**).

The region is dominated by irrigation and afforestation, with irrigation being the main land use. The urban and peri-urban areas within this region are Richmond and Amanzimtoti which receive piped water from the Mgeni System (previously from boreholes and Beaulieu Dam), and Nungwane Dam, respectively. The Mgeni System also supports the coastal area. The proposed Langa Dam near Baynesfield is located in the upper uMlaza River catchment (**Section 7.5.2 (a) in Volume 2**).

(ii) Surface Water

The hydrological characteristics for this region are summarised in **Table 11.1**.

Table 11.1 Hydrological characteristics of the Mlazi/Lovu Region (WR2012).

Region	River (Catchment)	Area (km^2)	Annual Average			
			Evaporation (mm)	Rainfall (mm)	Natural Runoff (million m^3/a)	Natural Runoff (mm)
Mlazi/Lovu	uMlaza River (U60)	1,439	1,200	833	184.0	128
	Lovu River (U70)	944	1,200	895	124.0	131
Hydrological Characteristics of the Upper uMlaza River (DWS 2013)						
U60A	Upper uMlaza River	105	1,200	981	22.65	216

(iii) Groundwater

The Mlazi/Lovu Region occurs in the KwaZulu-Natal Coastal Foreland and North-western Middleveld Groundwater Regions (**Section 2**). As such this Groundwater Region is characterised by a combination of intergranular and fractured arenaceous rocks.

- **Hydrogeological Units**

The hydrogeologically relevant lithologies recognised in the Mlazi/Lovu Region comprise sandstone, tillite and granite/gneiss.

- **Geohydrology**

The Natal Group Sandstone (NGS) is the most important water bearing lithology in the two catchments. Boreholes favourably located in the NGS provide good yields. Yields of 3 ℓ/s (greater than 10 000 ℓ/hr) are not uncommon where large scale fracturing/faulting provide conduits for groundwater movement.

- **Groundwater Potential**

Primary groundwater supplies using boreholes fitted with hand pumps, wind pumps or submersibles are obtainable in most of the lithological units. The exceptions are the Dwyka formation (tillites) or massive granites (southern portions of the Mlazi/Lovu Region). In these areas, groundwater supply could be obtained within an adjacent fault valley where the potential for high yielding boreholes is much enhanced.

The sandstone of the Natal Group represents the most productive groundwater-bearing lithology, followed by the granite/gneiss lithologies and the tillite sediments of the Dwyka Tillite Formation.

The highly fractured nature of the NGS in the Golokodo section of Umbumbulu and along linear fault features near Folweni are areas where high yielding boreholes are prevalent (**Figure 11.7**).

(iv) Water Quality

The algal numbers recorded at Nungwane Dam remain relatively low (**Figure 11.8**), although elevated nutrients are occasionally recorded particularly post rainfall run-off events. Although not apparent in the inflow or dam surface water data, the major rainfall/erosion/turbidity event in 2019 severely affected the deeper water of the impoundment, leading to sustained high raw water turbidity's and metals at the Amanzimtoti WTP during the winter period.

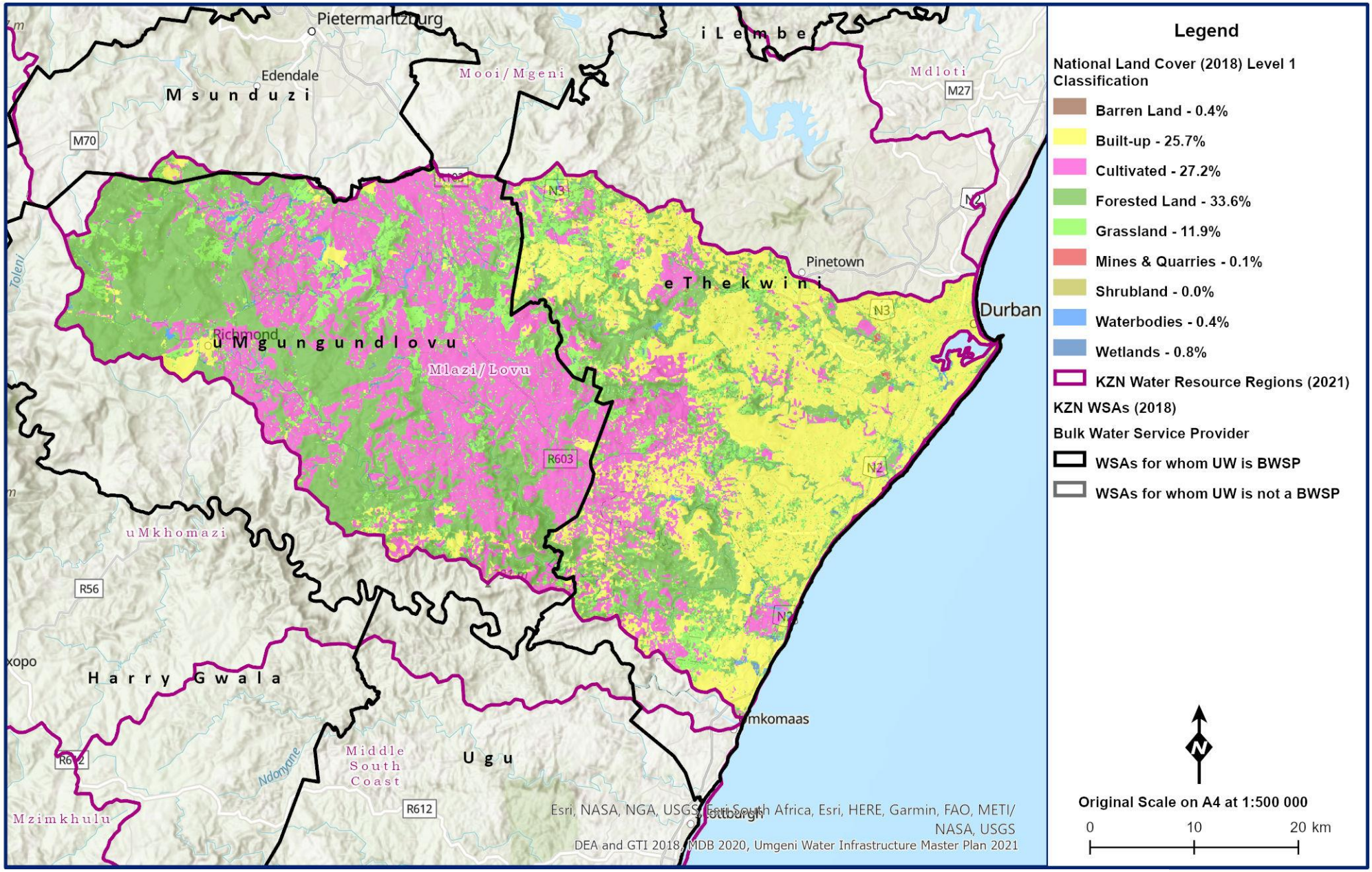


Figure 11.6 General layout of the Mlazi/Lovu Region (DEA and GTI 2018; MDB 2020; Umgeni Water 2021; WR2012).

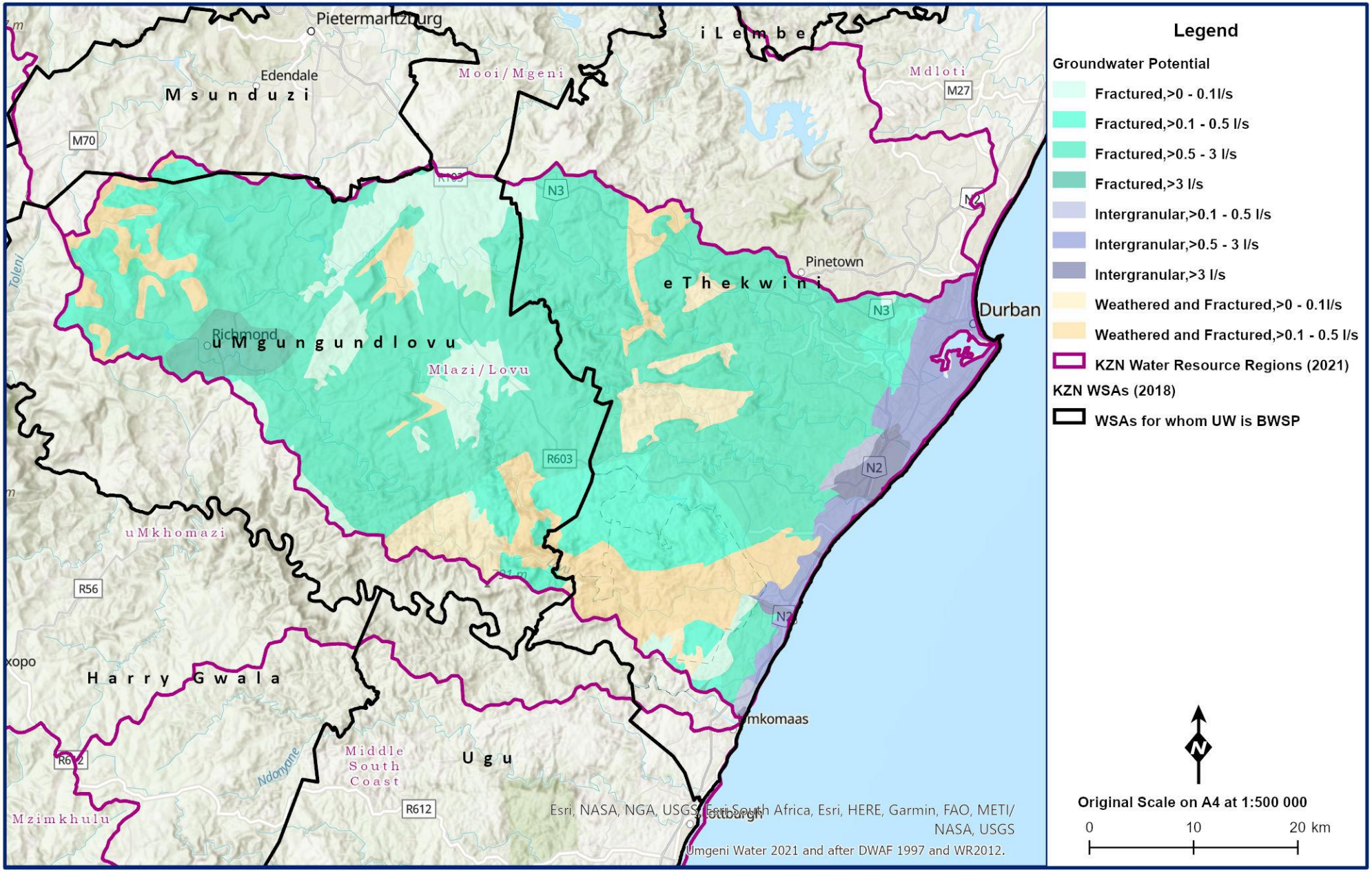


Figure 11.7 Groundwater potential in the Mlazi/Lovu Region (MDB 2020; Umgeni Water 2021; after DWAF 1997 and WR2012).

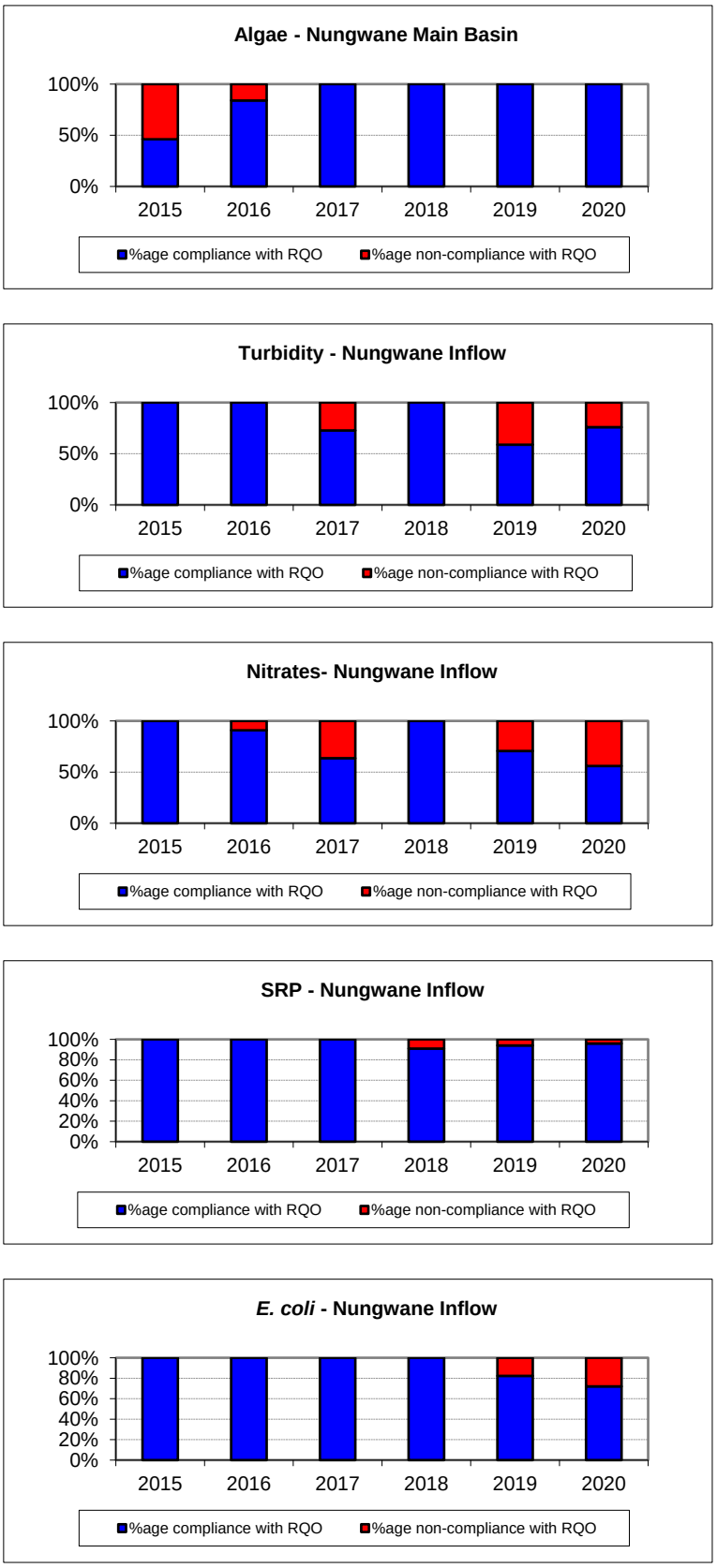


Figure 11.8 Percentage compliance vs. non-compliance with the Resource Quality Objective for Nungwane.

(b) uMkhomazi Region

See **Section 7.2.1(b) in Volume 2** for a description of the uMkhomazi Region.

The uMkhomazi Water Project is a large project which has been proposed to augment the supply of water to the Mgeni System (**Section 7.5.2 (a) in Volume 2**). The Smithfield Dam, a component of the project will be developed relatively high up in the catchment and will supply water through a tunnel and pipelines to the Mgeni System near Umlaas Road. Additional water is available in the lower reaches of the uMkhomazi River and can be utilised for supply to the Middle South Coast Areas.

A Detailed Feasibility Study (DFS) was undertaken on the Lower uMkhomazi Bulk Water Supply Scheme (BWSS) and proves that an off-channel storage dam (Ngwadini) could be constructed, low down in the catchment, as a source of water for the coastal area (**Section 11.7.3 (d)**). This scheme would augment potable water supply to the Upper and Middle South Coast. It is proposed that it will feed into the existing South Coast Pipeline and bulk distribution system at Quarry Reservoir. From this existing bulk reservoir water can be sent both north and south in the South Coast Pipeline which has been designed to be bi-directional (**Figure 11.75**).

(c) Middle South Coast

(i) Overview

The Middle South Coast region extends in a coastal strip from the uMkhomazi River southwards to the Mtwalume River (**Figure 11.9)**. The region includes the uMuziwezinto (Mzinto), Mpambanyoni, Mzumbe and Mtwalume river catchments in the U80 tertiary catchment. Whilst the region contains a number of rivers with significant runoff, no major impoundments exist in the region. The Umzinto supply system, which receives its water from the Umzinto WTP, includes the areas of Freeland Park, Hazelwood, Kelso, Pennington, Umzinto and Park Rynie. The Mtwalume supply system receives water from the Mtwalume WTP and includes the areas of Elysium, Ifafa, Mtwalume and Sezela. Afforestation and irrigation are widespread in the region.

(ii) Surface Water

The statistics of mean annual runoff for the catchments within the Middle South Coast region are summarised in **Table 11.2**.

Table 11.2 Hydrological characteristics for the Middle South Coast Region (WR2012).

Region	River (Catchment)	Area (km^2)	Annual Average			
			Evaporation (mm)	Rainfall (mm)	Natural Runoff (million m^3/annum)	Natural Runoff (mm)
Middle South Coast	Mpambanyoni River (U80)	555	1,200	895	58.9	110
	Mzimayi River (U80)	35	1,200	1,013	8.1	231
	uMuziwezinto River (U80)	146	1,200	1,013	33.9	232
	Fafa River (U80)	261	1,200	939	34.8	133
	Mtwalume River (U80)	552	1,200	887	53.4	97
	Mzumbe River (U80)	641	1,200	882	55.1	102

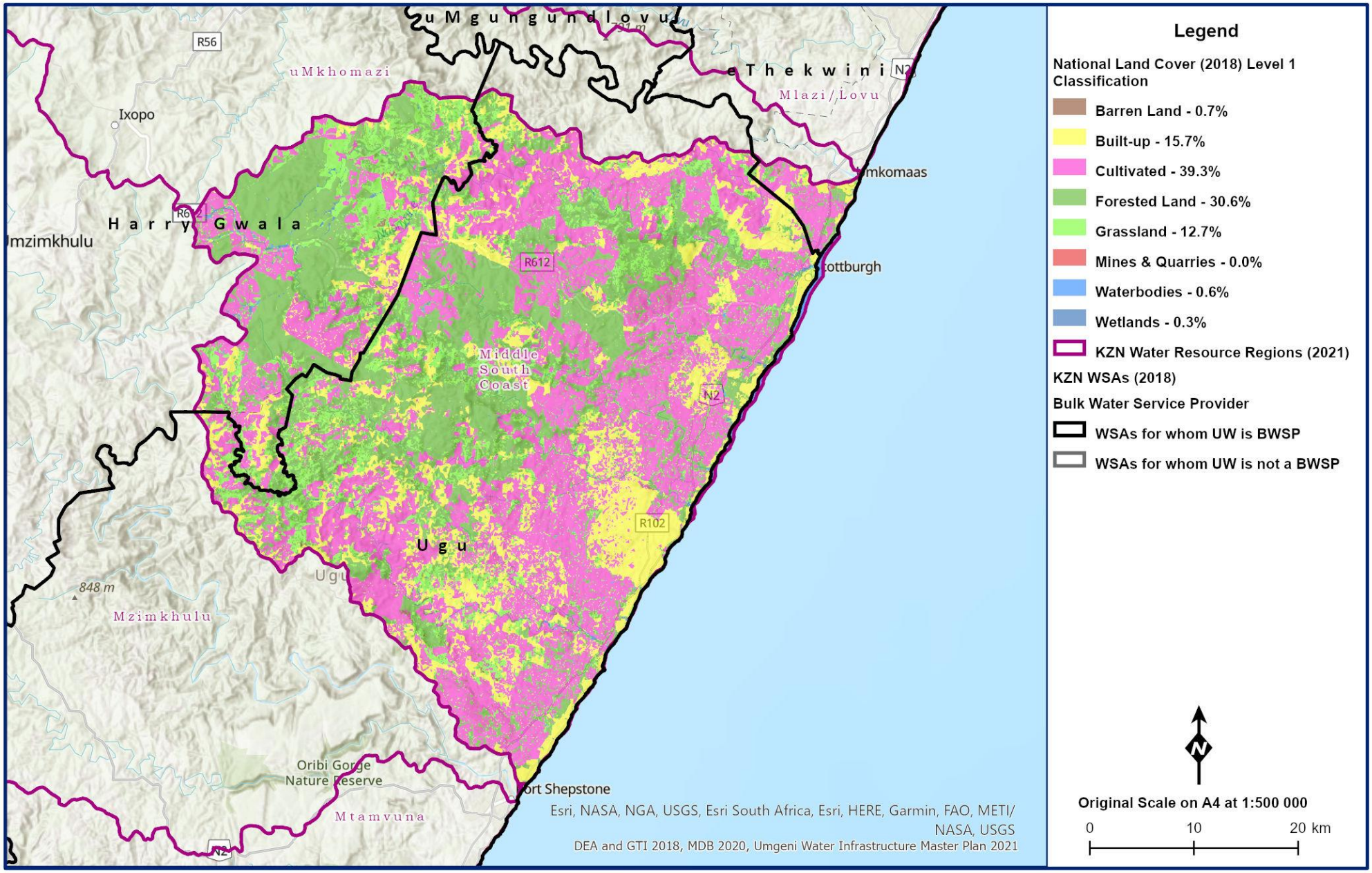


Figure 11.9 General layout of the Middle South Coast Region (DEA and GTI 2018; MDB 2020; Umgeni Water 2021; WR2012).

(iii) Groundwater

The Middle South Coast Region occurs in the KwaZulu-Natal Coastal Foreland Groundwater Region (**Section 2**). This Groundwater Region is characterised by fractured aquifers which are formed by predominantly arenaceous rocks consisting of sandstone and diamictite (Dwyka tillite).

• Hydrogeological Units

The hydrogeologically relevant lithologies recognised in the Middle South Coast comprise sandstone, mudstone/ shale, tillite and granite/gneiss.

• Geohydrology

On the South Coast the thickness of the Natal Group Sandstone (NGS) is irregular, decreasing northwards from a maximum in the Eastern Cape of about 500 m, to some 200 m in Oribi Gorge. North of the Mzimkulu River it is overstepped by the Dwyka Formation. The Dwyka is the most extensive lithological unit in the region. It occurs in a belt from northeast of Ixopo southwards to Ezingolweni. The shales of the Pietermaritzburg Formation outcrop chiefly in the uplands around Ixopo and extend southwards through Harding. They are extensively intruded by dolerite sills. The coastal regions especially prevalent in the Mtwalume catchment are the rocks of the Natal Metamorphic Province (NMP).

• Groundwater Potential

Primary groundwater supplies using boreholes fitted with handpumps, wind pumps or submersibles are obtainable in most of the lithological units. The exceptions are the Dwyka formation (tillites) or massive granites. In these areas groundwater supply could be obtained within an adjacent fault valley where the potential for high yielding boreholes is much enhanced.

The sandstone of the Natal Group represents the most productive groundwater-bearing lithology, followed by mudstone/shale lithologies, the granite/gneiss lithologies and the tillite sediments of the Dwyka Tillite Formation.

Boreholes favourable located in the Natal Group Sandstone (NGS), provide good yields. Yields of 3 ℓ/s (greater than 10 000 ℓ/hr) are not uncommon where large scale fracturing/faulting provide conduits for groundwater movement (**Figure 11.10**).

Boreholes located in metamorphic lithologies indicate yield characteristics in the range 0.1 to 0.5 ℓ/s, with a median value of 0.3 ℓ/sec.

(iv) Water Quality

Sewer problems experienced in Umzinto town have contributed to the recorded non-compliance with the respective RQO limits. The experienced sewage related issues are characterised by the recorded *E. coli* and SRP non-compliances (**Figure 11.11**).

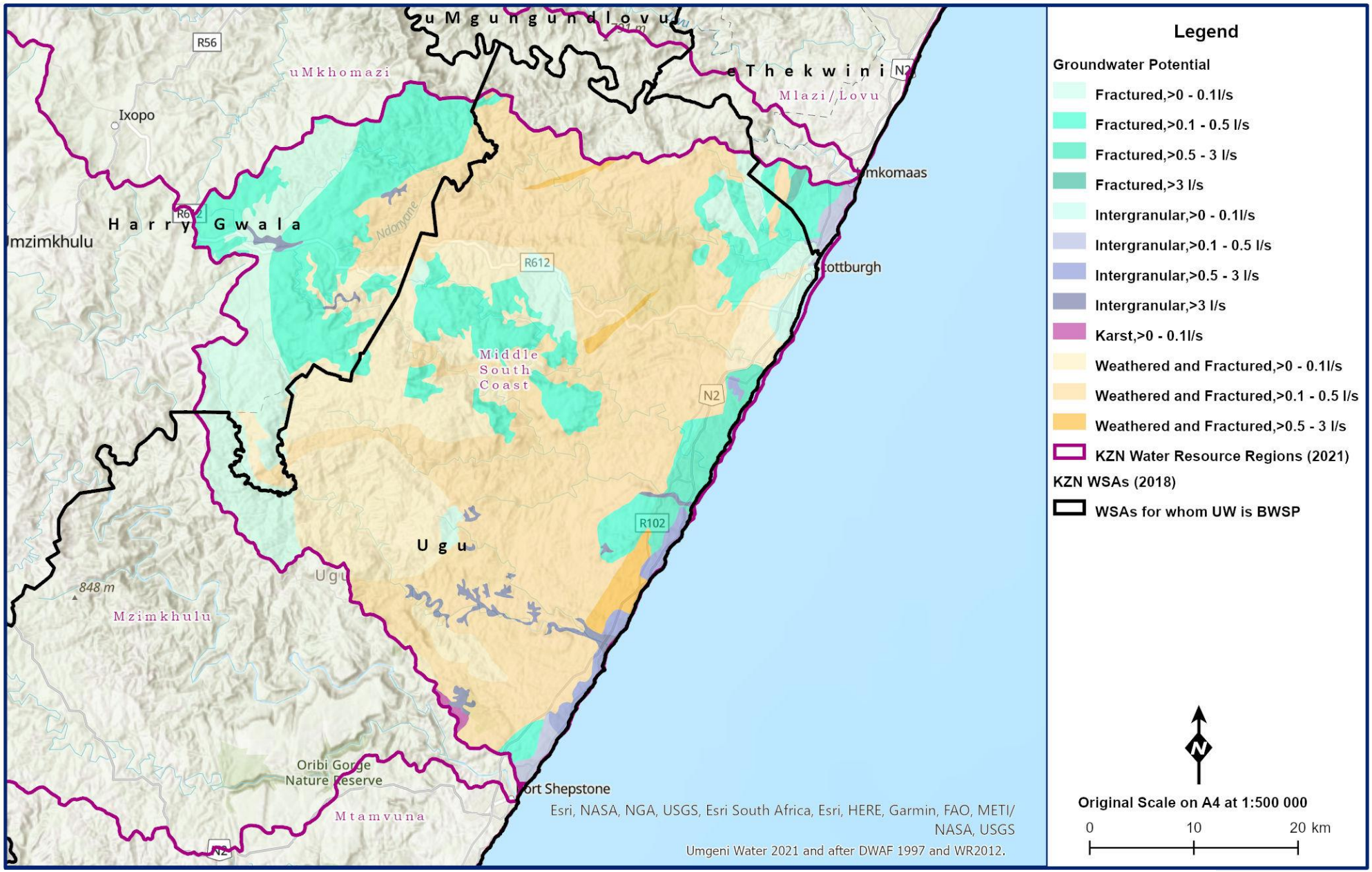


Figure 11.10 Groundwater potential in the Middle South Region (MDB 2020; Umgeni Water 2021; after DWAF 1997 and WR2012).

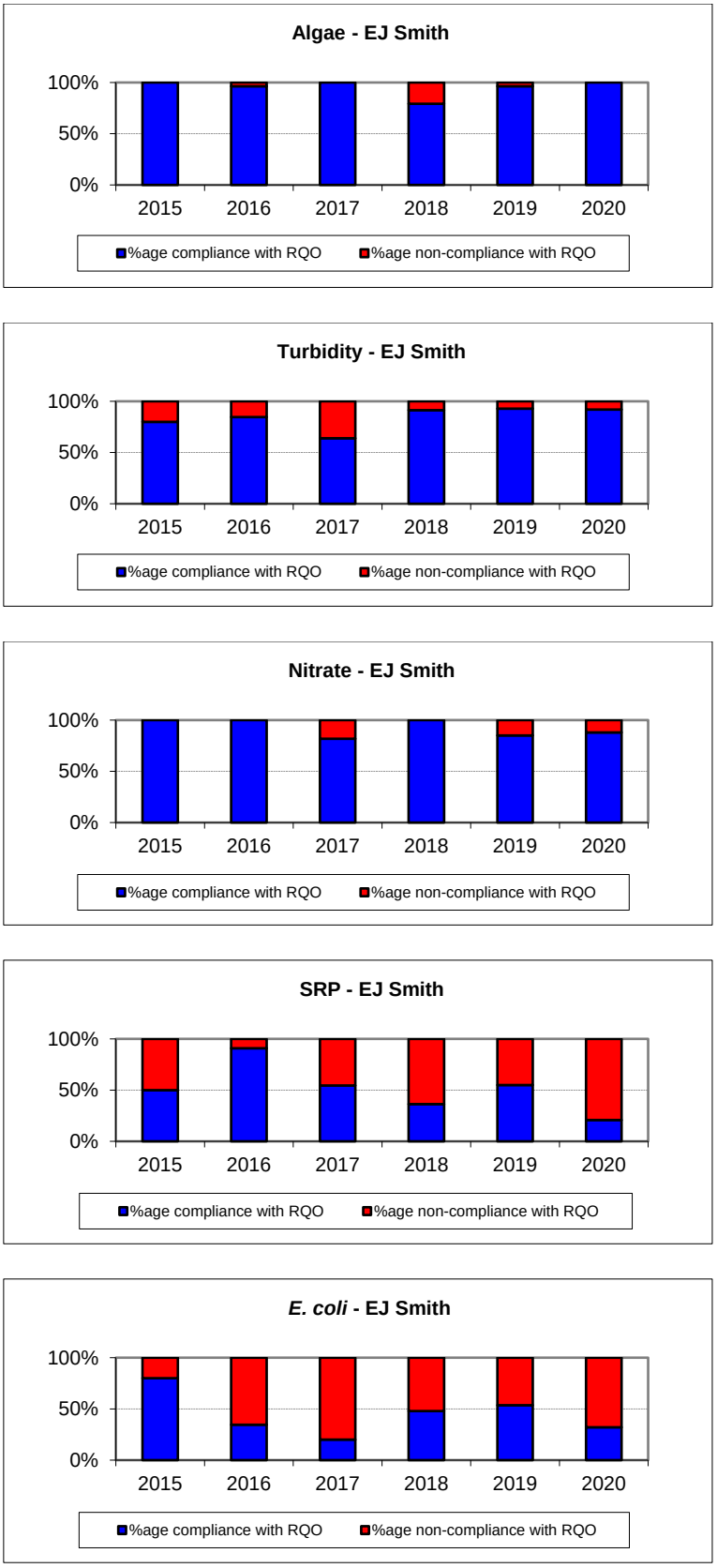


Figure 11.11 Percentage compliance vs. non-compliance with the Resource Quality Objective for the E.J. Smith Dam – Umzinto System.

The elevated *E. coli* and turbidity results recorded at Mtwalume (**Figure 11.12**) are largely due to catchment related run-off events (run-of-river abstraction, no upstream impoundment).

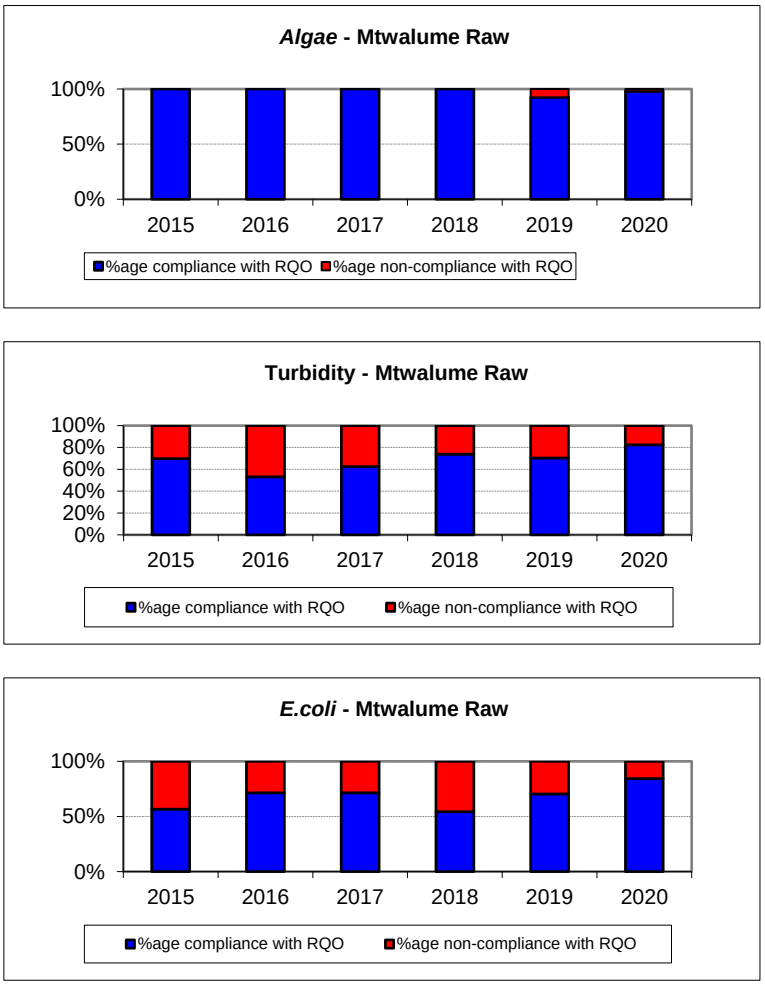


Figure 11.12 **Percentage compliance vs. non-compliance with the Resource Quality Objective for the Mtwalume.**

The algal counts recorded in Mhlabatshane Dam demonstrate an improvement when the results recorded in the 2020 are compared to 2019 results (**Figure 11.13**). The recorded elevated nutrients confirm the catchment related contamination that is transported to the dam by rainfall related runoff. The catchment is relatively small, steep and supports numerous small-scale farming and animal grazing, with significant erosion challenges.

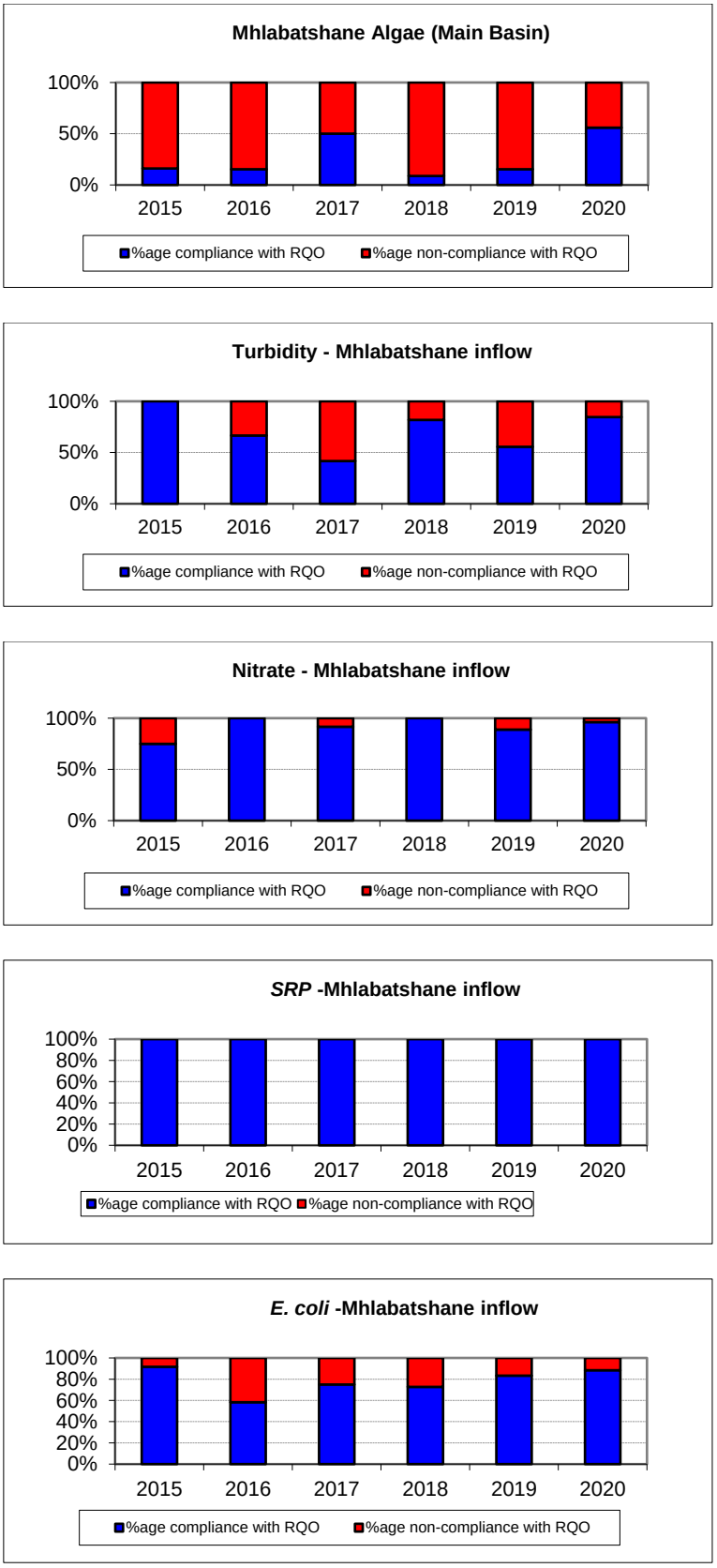


Figure 11.13 Percentage compliance vs. non-compliance with the Resource Quality Objective for Mhlabatshane Dam.

(d) Mzimkulu Region

(i) Overview

The Mzimkulu Region comprises of the tertiary catchment T50 (**Figure 11.14**). The main towns situated in the Mzimkulu Catchment (**Figure 11.14**) are Underberg, Himeville, Creighton, Harding and Port Shepstone. The main land uses in the catchment are domestic, rural use, afforestation and irrigation.

A water resource feasibility study for the entire Mzimkulu catchment was undertaken by DWS in 2011, and some of the results have been referenced in the sections below.

The Mzimkulu River water demands are primarily from agriculture and afforestation; these are the largest water users in the system representing 31% and 41% of total water use respectively. The remaining demands are rural and urban demands (10%), dry-land sugar cane and stock watering (3% and 1% respectively), and invasive alien vegetation (14%).

The Mzimkulu River agricultural demand is primarily supplied through direct abstractions from rivers and streams, as well as from farm dams. The catchment irrigation supply is estimated to be 87 million m^3/annum and stock water demands account for an additional 4 million m^3/annum (DWA 2011). Sugarcane is not irrigated in this catchment and is considered to be a dry land crop accounting for 7 million m^3/annum of the total catchment water demand.

Forest plantations are distributed throughout the Mzimkulu catchment but are concentrated in the Bisi, the Mzimkhulwana and the Middle Mzimkulu sub-catchments. Forestry is estimated to be the largest consumer of water in the Mzimkulu catchment and is estimated to use 113 million m^3/annum.

The industrial and domestic water demands in the rural and urban areas are supplied from point source abstractions along the Mzimkulu River and its tributaries. Rural settlements are found throughout the catchment and obtain their water from diffuse sources, including groundwater. Rural water requirements are estimated to be in the order of 7 million m^3/annum and urban water requirements within the catchment are estimated to be in the order of 4 million m^3/annum. Port Shepstone's demand, which is supplied from the catchment, is estimated to be some 18.5 million m^3/annum.

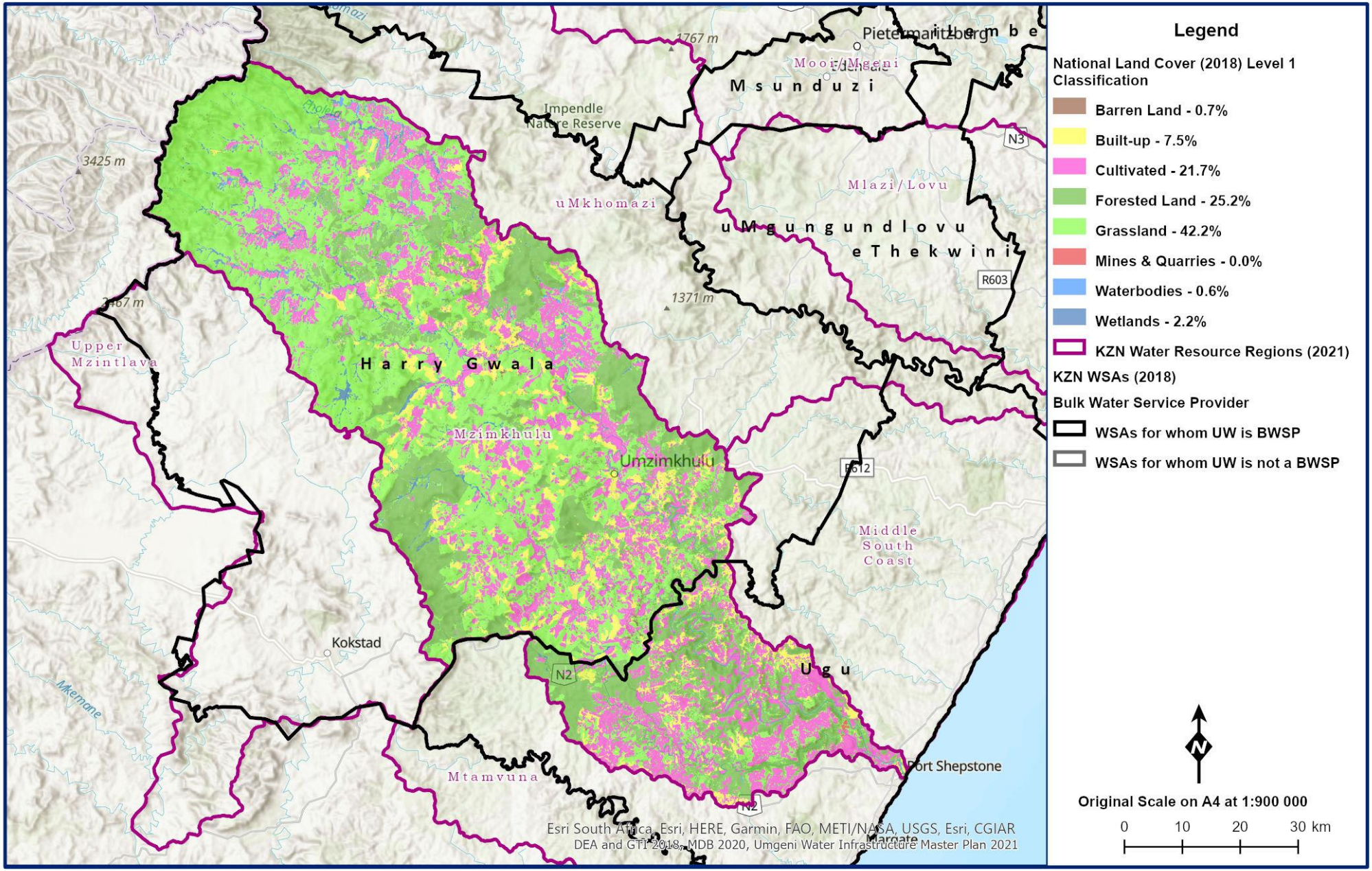


Figure 11.14 General layout of the Mzimkulu Region (DEA and GTI 2018; MDB 2020; Umgeni Water 2021; WR2012).

(ii) Surface Water

The hydrological characteristics for the Mzimkulu Region are shown in **Table 11.3**.

Table 11.3 Hydrological characteristics of the Mzimkulu Region (WR2012).

Region	River (Catchment)	Area (km^2)	Annual Average			
			Evaporation (mm)	Rainfall (mm)	Natural Runoff (million m^3/annum)	Natural Runoff (mm)
Mzimkulu	Mzimkulu River (T51 & T52)	6 678	1,190	934	1 373.0	206

(iii) Groundwater

The Mzimkulu Region occurs in the KwaZulu-Natal Coastal Foreland and Transkeian Coastal Foreland and Middleveld Groundwater Regions (**Section 2**). This Groundwater Region is characterised by a combination of intergranular and fractured arenaceous rocks. The aquifer types occurring in this region are mapped as low to medium potential.

• Hydrogeological Units

The hydrogeologically relevant lithologies in the Mzimkulu Region comprise of the siltstone/shale, feldspathic sandstones and tillites of the Karoo Supergroup; the micaceous sandstones of the Natal Group; and the granite/gneiss of the Natal Metamorphic Province (NMP).

These hydrogeological units are clearly defined within the Mzimkulu River catchment and occur in distinct bands or areas. The Natal group sandstones can be found in a relatively small area to the south of the Mzimkulu River in the Oribi Flats area as well as around the town of Paddock. Extending inland from the Oribi Flats area, the Mzimkulu River is bounded on both sides by extensive tillite deposits of the Dwyka Formation. The Dwyka Formation covers the Ntabankulu and St Faiths area and extends southwards to Izingolweni. Further west all the way up to the Mzimkulu River source at the foothills of the Drakensberg Mountains the hydrogeology is dominated by the Karoo Supergroup. Here shales are interspersed with igneous dolerite intrusions. The shales of the Pietermaritzburg Formation outcrop chiefly in the uplands around Ixopo and extend southwards through Harding.

• Geohydrology

A groundwater assessment was undertaken as part of the DWS "Mzimkhulu River Catchment Water Resources Study" (2011)[1]. Conclusions and recommendations from this assessment were:

- "Elevated groundwater yields occur to the north of Rietvlei, directly east of Creighton and from west-southwest to northwest of Underberg."
- "Rainfall recharges the shallow aquifers in these areas and it is intercepted by the boreholes in the catchment."
- "Populations (both rural and urban) are situated within these areas, such that groundwater supply to these communities appears viable."

[1] See http://www.dwa.gov.za/Projects/NCWABENI/documents/Mzimkhulu%20River%20Catchment%20Water%20Resources%20Study.pdf

- "The principle high-yielding geological formations are the Drakensberg basalts, the Karoo dolerites and the closely-bedded argillaceous Karoo Supergroup rocks."
- "Dolerite dyke and sill contacts and observed lineaments act as the main pathways for groundwater movement and to a certain extent, storage."
- "Areas underlain by shallower soil profiles and soils with increased clay content typically exhibit higher yields."
- "Magnesium (Mg), nitrate (NO_3) and fluoride (F) are the only potentially problematic determinants in the groundwater, with these three 'peaking' in the southern areas of the Mzimkhulu River catchment."
- "Groundwater exploration should be carried out from Rietvlei to the north and northwest and be continued near the Centecow Mission; directly east of Creighton; and from west-southwest to northwest of Underberg."

(DWS 2011: 36 – 37)

• Groundwater Potential

Primary groundwater supplies using boreholes fitted with hand pumps, wind pumps or submersibles are obtainable in most of the lithological units. The exceptions are the Dwyka formation (tillites) or massive granites. In these areas groundwater supply could be obtained within an adjacent fault valley where the potential for high yielding boreholes is much enhanced.

The sandstone of the Natal Group represents the most productive groundwater-bearing lithology, followed by mudstone/shale lithologies, the granite/gneiss lithologies and the tillite sediments of the Dwyka Tillite Formation.

Boreholes favourably located in the Natal Group Sandstone (NGS), provide good yields. Yields of 3ℓ/s (greater than 10 000 ℓ/hr) are not uncommon where large scale fracturing/faulting provide conduits for groundwater movement (**Figure 11.15**).

Boreholes located in metamorphic lithologies indicate yield characteristics in the range 0.1 to 0.5 ℓ/s, with a median value of 0.3 ℓ/s.

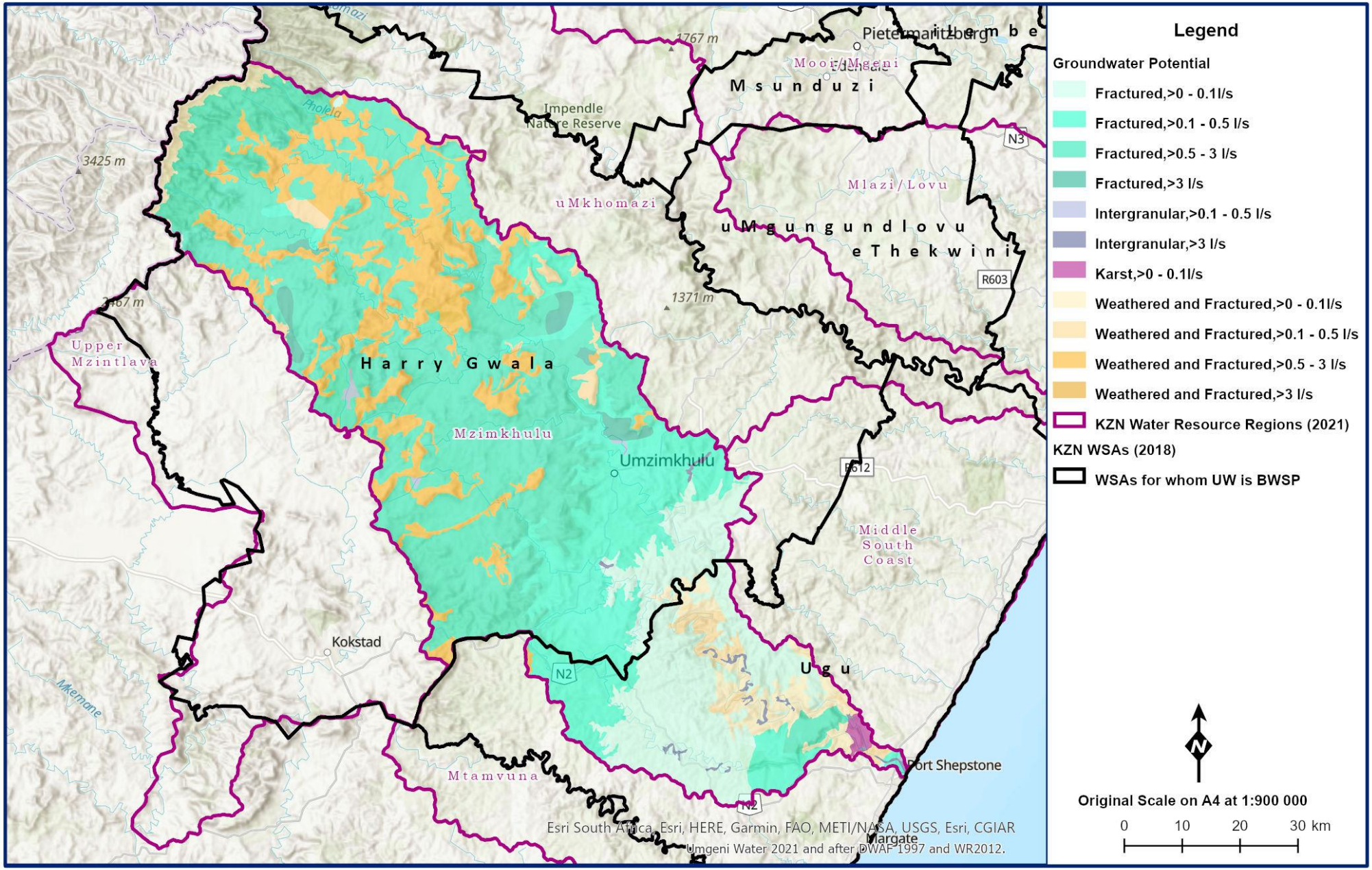


Figure 11.15 Groundwater potential in the Mzimkulu Region (MDB 2020; Umgeni Water 2021; after DWAF 1997 and WR2012).

(iv) Water Quality

Borehole water quality data is very scarce, although from the information available the following general statements can be made:-

- All boreholes, for which there are values, fall within the SANS 241 maximum permissible limits for conductivity.
- Boreholes with elevated Iron (Fe) levels are not uncommon. Iron is a problem as it stains laundry but it is not a health risk.
- Some boreholes exceed Nitrate (NO_3) levels, but these are isolated.

Generally, the borehole water quality is good.

(e) Mtamvuna Region

(i) Overview

The Mtamvuna Region comprises of the tertiary catchment of T40 (the Mtamvuna River and a few small coastal rivers to the north of it (**Figure 11.16**).

The main water requirements within this area are domestic and both the urban and rural sectors. The urban requirements are from the coastal towns that include Margate, Ramsgate and Port Edward. Port Shepstone is situated in this region but is supplied with water from the Mzimkulu River (**Section 11.2.1(d)**).

The land use of the Mtamvuna Catchment consists of communal land (majority of the area), relatively large areas of afforestation and dry-land sugar cane.

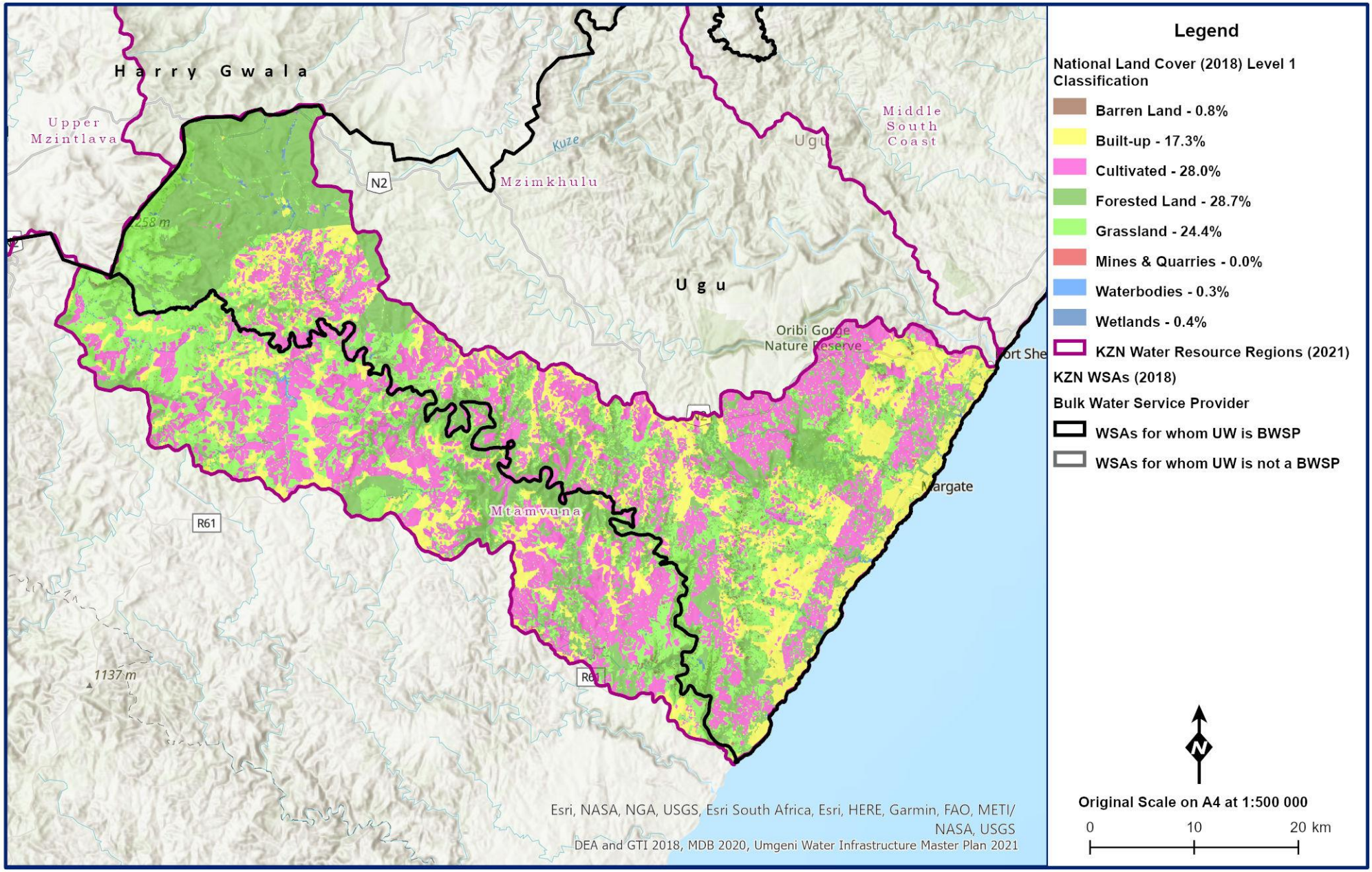


Figure 11.16 General layout of the Mtamvuna Region (DEA and GTI 2018; MDB 2020; Umgeni Water 2021; WR2012).

(ii) Surface Water

The hydrological characteristics for the Mtamvuna Region are shown in **Table 11.4**.

Table 11.4 Hydrological characteristics of the Mtamvuna Region (WR2012).

Region	River (Catchment)	Area (km^2)	Annual Average			
			Evaporation (mm)	Rainfall (mm)	Natural Runoff (million m^3/annum)	Natural Runoff (mm)
Mtamvuna	Mtamvuna River (T40)	2 216	1 180	912	426.0	192

(iii) Groundwater

The Mtamvuna Region is located in the KwaZulu-Natal Coastal Foreland and Transkeian Coastal Foreland and Middleveld Groundwater Regions (**Section 2**). As such this Groundwater Region is characterised by and combination of intergranular and fractured arenaceous rocks. The aquifer types occurring in this region are mapped as low to medium potential.

- **Hydrogeological Units**

The hydrogeologically relevant lithologies recognised in the Mtamvuna Region comprise of the siltstone/shale, feldspathic sandstones and tillites of the Karoo Supergroup; the micaceous sandstones of the Natal Group; and the granite/gneiss of the Natal Metamorphic Province (NMP).

These hydrogeological units are clearly defined within the Mtamvuma River catchment and occur in distinct bands or areas in the Mzimkulu River catchment. The Natal group sandstones can be found in a narrow band extending inland from the coast at the mouth of the Mtamvuma River. Inland around the Izingolweni area on both sides of the river extensive tillite deposits of the Dwyka Formation occur. The headlands of the river around the town of Harding are predominated by shales that are interspersed with igneous dolerite intrusions.

- **Geohydrology**

Excluding the very limited alluvial deposits, which occur within the valleys of some of the major rivers, the water bearing properties of all the other lithological formations depend on secondary openings formed as a result of either tectonic deformation, weathering processes, unloading by erosion or a combination of these processes.

Jointing in the study area is present to a greater or lesser extent in all the rocks. Jointing and fissuring are of great importance, since they influence the infiltration capacity and hence recharge of the secondary aquifers and provide interconnection between less transmissive rock masses.

A complex array of faults characterise the study area. Faults not only affect the distribution and position of aquifers but may also either impede groundwater movement or act as conduits, some of which my extend to great depth, bringing deep seated waters to surface e.g. Ntlakwe-Bongwan fault located in the Mtamvuma River valley.

- **Groundwater Potential**

Primary groundwater supplies using boreholes fitted with hand pumps, wind pumps or submersibles are obtainable in most of the lithological units. The exceptions are the Dwyka formation (tillites) or

massive granites. In these areas groundwater supply could be obtained within an adjacent fault valley where the potential for high yielding boreholes is much enhanced.

The sandstone of the Natal Group represents the most productive groundwater-bearing lithology, followed by mudstone/shale lithologies, the granite/gneiss lithologies and the tillite sediments of the Dwyka Tillite Formation.

Boreholes favourably located in the Natal Group Sandstone (NGS), provide good yields. Yields of 3 ℓ/s (greater than 10 000 ℓ/hr) are not uncommon where large scale fracturing/faulting provide conduits for groundwater movement (**Figure 11.17**). Boreholes located in metamorphic lithologies indicate yield characteristics in the range 0.1 to 0.5 ℓ/s, with a median value of 0.3 ℓ/sec.

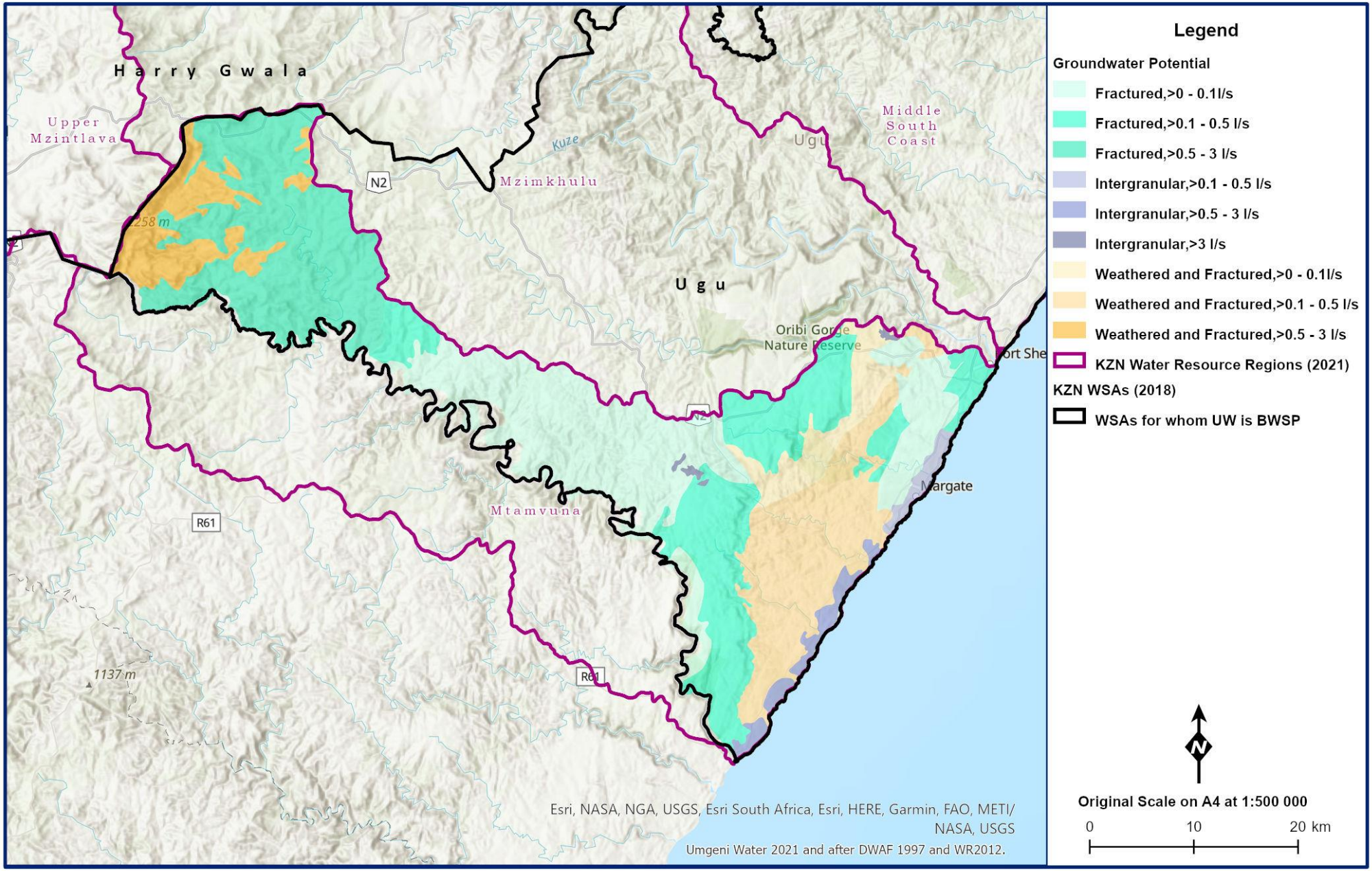


Figure 11.17 Groundwater potential in the Mtamvuna Region (MDB 2020; Umgeni Water 2021; after DWAF 1997 and WR2012).

(iv) Water Quality

Borehole water quality data is scarce in this area although from the information available the following general statements can be made:-

- All boreholes, for which there are values, fall within the SANS 241 maximum permissible limits for conductivity.
- Boreholes with elevated Iron (Fe) levels are not uncommon. Iron is a problem as it stains laundry but it is not a health risk.
- Some boreholes exceed Nitrate (NO_3) levels, but these are isolated.

Generally, the borehole water quality is good.

11.2.2 Reserve

(a) Mlazi/Lovu Region

No comprehensive assessment of the ecological Reserve of either the uMlaza or the Lovu Rivers has been undertaken to date. The catchment has surplus water available, even taking the estimated ecological Reserve requirements into account. There is no urgency for the ecological Reserve determination and compulsory licensing processes in the catchment.

DWS (2016) found that the uMlaza and Lovu Rivers are in class B/C present ecological state and the current state is recommended for the future. The present ecological state (PES) of various rivers in the Mlazi/Lovu Region and target ecological categories TEC are detailed in the DWS report. Various nodes require improvements as a result of non-flow-related/anthropogenic issues. If the recommended ecological category (REC) is attainable then it has been included in the catchment configuration.

(b) uMkhomazi Region

No comprehensive assessment, using the accepted standardised methodology, has been undertaken of the ecological Reserve of uMkhomazi River to date. A Reserve determination was undertaken in the late 1990's as part of the pre-feasibility investigations into a transfer scheme from uMkhomazi to uMngeni catchment. DWS (2016) found that the present ecological state of the uMkhomazi River is in a B class in the upper reaches and a C class in the lower reaches. These ecological classes are also recommended for future considering the proposed uMkhomazi-Mgeni Transfer Scheme (uMkhomazi Water Project **Section 7.2.1** in **Volume 2**).

(c) Middle South Coast Region

No comprehensive assessment of the ecological Reserve of the Middle South Coast Region has been undertaken to date. Estimates of the Reserve indicate that the ecological Reserve will have a significant influence on the amount of water available in the catchment.

The present ecological state (PES) of various rivers in the Middle South Coast Region is detailed in the DWS report (DWS, 2016). The target ecological categories (TEC) of various rivers in the Middle South Coast Region are shown in the report**.** Various nodes require improvements as a result of non-flow-related/anthropogenic issues. If the recommended ecological category (REC) is attainable then it has been included in the catchment configuration.

(d) Mzimkulu Region

The Reserve estimates, based on desktop studies, indicate that the Ecological Reserve will have a large impact on the availability of water in the catchment. The implementation of the Reserve will result in shortfalls that will increase in magnitude and frequency occurring every second year on average. It has been recommended from previous studies that, in order to provide for the water requirements for all user sectors, including the Reserve, the construction of an off-channel storage dam in one of the tributaries to the Mzimkulu River, should be considered.

The present ecological state (PES) of various rivers in the Mzimkhulu Region is detailed in the DWS report (DWS, 2016). The target ecological categories (TEC) of various rivers in the Mzimkhulu Region are also in the report**.** Various nodes require improvements as a result of non-flow-related/anthropogenic issues. If the recommended ecological category (REC) is attainable then it has been included in the catchment configuration.

(e) Mtamvuna Region

DWS (2016) found that Mtamvuna River is currently in a Class C ecological state and this state is also recommended for the future.

The present ecological state (PES) of various rivers in the Mtamvuna Region is detailed in the report (DWS, 2016). The target ecological categories (TEC) of various rivers in the Mtamvuna Region are in the report**.** Various nodes require improvements as a result of non-flow-related/anthropogenic issues. If the recommended ecological category (REC) is attainable then it has been included in the catchment configuration.

11.2.3 Existing Water Resource Infrastructure and Yields

(a) Mlazi/Lovu Region

The significant dams in the region are Shongweni Dam on the uMlaza River (Quaternary U60D), Nungwane Dam situated on the Nungwane River (Quaternary U70D), which is a tributary of the Lovu River, Beaulieu Dam on the Lovu River (quaternary U70A), and Umgababa Dam situated on the Mgababa River within the U70 catchment (**Table 11.5**).

Table 11.5 Dams in the Mlazi/Lovu Region.

Impoundment	River	Capacity (million m^3)	Purpose
Nungwane Dam	Nungwane	2.14	Domestic
Umgababa Dam	Umgababa	1.28	Recreation
Beaulieu Dam	Lovu	2.40	Irrigation/Domestic
Shongweni Dam	uMlaza	3.80	Recreation

The characteristics of Nungwane Dam are summarised in **Table 11.6** and **Figure 11.18**. This dam is owned and operated by Umgeni Water and supplies raw water to the Amanzimtoti WTP.

Figure 11.18 Nungwane Dam.

Table 11.6 Characteristics of Nungwane Dam.

Catchment Details	
Incremental Catchment Area:	58 km^2
Total Catchment Area:	58 km^2
Mean Annual Precipitation:	938 mm
Mean Annual Runoff:	11.9 million m^3
Annual Evaporation:	1 200 mm
Dam Characteristics	
Gauge Plate Zero:	345.95 mASL
Full Supply Level:	362.7 mASL
Spillway Height:	16.75 m
Net Full Supply Capacity:	2.076 million m^3
Dead Storage:	0.059 million m^3
Total Capacity:	2.135 million m^3 (February 2012)
Surface Area of Dam at Full Supply Level:	0.31 km^2
Original Measured Dam Capacity	2.341 million m^3 (June 1974)
Second Measured Dam Capacity	2.179 million m^3 (December 1977)
Dam Type:	Concrete with earth embankment
Crest Length:	Spillway Section: 76.2 m Non-Spillway Section: 312.5 m
Type of Spillway:	Uncontrolled
Capacity of Spillway:	760 m^3/s
Date of Completion:	1977
Date of Last Area Capacity Survey:	2012
Date of Next Area Capacity Survey	2022

The guide for determining the frequency of dam basin surveys for siltation purposes is shown in **Table 11.7.**

Table 11.7 Criteria for choosing the siltation survey return period based on dam storage.

Storage (million m^3)	Return Period (years)
≤ 1	5
> 1 ≤ 5	10
> 5 ≤ 100	15
> 100	20

Beaulieu Dam is dedicated to support irrigation near Richmond. The Umgababa and Shongweni dams were initially used to supply water for mining and domestic purposes respectively. These dams are no longer used for their primary purpose and are now used for recreational purposes only.

The yield information for the existing water resource developments in the Mlazi/Lovu Region can be seen in **Table 11.8**.

Table 11.8 Yield Information for the existing water resource developments in the Mlazi/Lovu Region.

Impoundment	River	Capacity (million m^3)	Yield (million m^3/annum)	Stochastic Yield (million m^3/annum)	
			Historical	1:50	1:100
Nungwane Dam	Nungwane	2.24	2.2 (6.0 Mℓ/day)	3.6* (9.9 Mℓ/day)	3.3* (9.0 Mℓ/day)

** Umgeni Water 2012*
 # excl. Ecological reserve

Sustained irrigation, utilising groundwater from production boreholes occurs in the Umlaas, Eston and Richmond areas. These boreholes yield between 5 and 20 ℓ/s.

Historically, the town of Richmond was supplied with water from Beaulieu Dam and this was treated at a treatment plant within the town. This source of water was augmented from six boreholes which have recorded pump tested yields of 470 kℓ/day in total. This groundwater scheme is no longer in use and Richmond Town is now supplied by Umgeni Water via the Richmond pipeline.

(b) uMkhomazi Region

There are no current impoundments on the uMkhomazi River and all water abstracted from this resource is from run-of-river yield. There are, however, two impoundments that will increase the yield of the system and allow for abstraction of water for treatment and potable use. The first is the Smithfield Dam which is described in **Section 7.5.2 (a)** and the second is the Ngwadini Off-channel Storage Dam. The Ngwadini Dam is to be constructed by Umgeni Water over the next six years (**Section 11.7.3 (d)**). The yield for this impoundment was determined as part of a water resources yield assessment undertaken for the uMkhomazi Water Project Feasibility Study and is presented in **Table 11.9.**

Table 11.9 Yields for proposed Lower uMkhomazi BWSS (Ngwadini Dam) (UW 2016).

Scenario	Time Slice	Support Releases	Ngwadini Dam Yield/Target (1:100)	
		(Smithfield to Ngwadini)	Mℓ/day	Million m^3/annum
Ngwadini Dam	2012	None	93	34
	2050 (Target Abstraction-70 Mℓ/day)	Yes	70	26
	2050 (Target Abstraction-95 Mℓ/day)	Yes	95	35
	2050 (Target Abstraction-150 Mℓ/day)	Yes	150	55

The yield available at Ngwadini Dam prior to the commissioning of Smithfield Dam is indicated at a 2012-development level.

The table also shows the yield available at Ngwadini Dam subsequent to the commissioning of Smithfield Dam which can provide support releases (2050-development level).

(c) Middle South Coast Region

The significant infrastructure in the Middle South Coast Region (**Table 11.10**) include the existing impoundments of the Umzinto Dam (**Figure 11.19, Table 11.11**) on the uMuziwezinto (Mzinto) River, the E.J. Smith Dam (**Figure 11.20, Table 11.12**) on the Mzimayi River and the Mhlabatshane Dam (**Figure 11.21**, **Table 11.13**) on the Mhlabatshane River, a tributary of the Umzumbe River.

Table 11.10 Yield Information for the existing water resource infrastructure in the Middle South Coast Region.

Impoundment	River	Capacity (million m^3)	Yield (million m^3/annum)	Stochastic Yield (million m^3/annum)	
			Historical	1:20	1:50
E.J. Smith Dam	Mzimayi	0.89	0.9 (2.5 Mℓ/day)	1.7 (4.7 Mℓ/day)	1.2 (3.3 Mℓ/day)
Umzinto Dam	uMuziwezinto	0.42	1.6 (4.4 Mℓ/day)	3.2 (8.8 Mℓ/day)	2.0 (5.6 Mℓ/day)
Mhlabatshane Dam	Mhlabatshane	1.5	Not Available	Not Available	1.5 (4.1 Mℓ/day)
Mtwalume (Run-of-River)	Mtwalume	-	-	3.20 (8.8 Mℓ/day)	2.7 (7.5 Mℓ/day)

It is estimated that the available water resources for the Mhlabatshane Bulk Water Supply Scheme is 2.4 million m^3/annum after accounting for all stream flow reduction activities including the reserve (Stemele Bosch and Associates 2007).

Figure 11.19 Umzinto Dam.

Table 11.11 Characteristics of Umzinto Dam.

Catchment Details	
Incremental Catchment Area:	51.6 km^2
Total Catchment Area:	51.6 km^2
Mean Annual Precipitation:	985 mm
Mean Annual Runoff:	6.91 million m^3
Annual Evaporation:	1 200 mm
Dam Characteristics	
Gauge Plate Zero:	125.3 mASL
Full Supply Level:	142 mASL
Spillway Height:	16.7 m
Net Full Supply Capacity*:	0.38 million m^3
Dead Storage:	0.04 million m^3
Total Capacity*:	0.42 million m^3 (October 2010)
Surface Area of Dam at Full Supply Level:	0.0734 km^2
Original Measured Dam Capacity	0.480 million m^3 (June 1997)
Dam Type:	Concrete
Material Content of Dam Wall:	Concrete: 27 500 m^3
Crest Length:	Spillway Section: 52 m Non-Spillway Section: 63 m
Type of Spillway:	Uncontrolled
Capacity of Spillway:	730 m^3/s
Future Capacity Once Dam Wall has been Raised:	N/A
Date of Completion	1983
Date of Last Area Capacity Survey:	2010
Date of Next Area Capacity Survey	2020

Figure 11.20 E.J. Smith Dam.

Table 11.12 Characteristics of E.J. Smith Dam.

Catchment Details	
Incremental Catchment Area:	15.84 km^2
Total Catchment Area:	15.84 km^2
Mean Annual Precipitation:	1060 mm
Mean Annual Runoff:	3.43 million m^3
Annual Evaporation:	1 240 mm
Dam Characteristics	
Gauge Plate Zero:	93.0 mASL
Full Supply Level:	109.1 mASL
Spillway Height	16.1 m
Net Full Supply Capacity:	0.80 million m^3
Dead Storage:	0.09 million m^3
Total Capacity:	0.89 million m^3 (November 2010)
Surface Area of Dam at Full Supply Level:	0.1724 km^2
Original Measured Dam Capacity	0.979 million m^3 (June 1997)
Dam Type:	Concrete
Material Content of Dam Wall:	Concrete: 3 800 m^3
Crest Length:	Spillway Section: 24.4 m Non-Spillway Section: 82.6 m
Type of Spillway:	Uncontrolled
Capacity of Spillway:	220 m^3/s
Date of Completion:	1966
Date of Last Area Capacity Survey:	2010
Date of Next Area Capacity Survey	2020

Figure 11.21 Mhlabatshane Dam.

Table 11.13 Characteristics of Mhlabatshane Dam.

Catchment Details	
Incremental Catchment Area:	43.2 km^2
Total Catchment Area:	339 km^2
Mean Annual Precipitation:	890 mm
Mean Annual Runoff:	3.94 million m^3
Annual Evaporation:	1200 mm
Dam Characteristics	
Gauge Plate Zero:	587 mASL
Full Supply Level:	607 mASL
Net Full Supply Capacity:	1.35million m^3 (July 2018)
Spillway Height:	20 m
Dead Storage:	0.15
Total Capacity:	1.50 million m^3
Original Measured Dam Capacity	1.58 million m^3 (October 2014)
Surface Area of Dam at Full Supply Level:	0.158 km^2
Dam Type:	Concrete
Material Content of Dam Wall:	Concrete with earth embankment
Crest Length:	Spillway section: 25m Non-spillway section: N/A
Type of Spillway:	Concrete
Capacity of Spillway:	N/A
Date of Completion:	2012
Date of Last Area Capacity Survey:	2018
Date of Next Area Capacity Survey	2028

(d) Mzimkulu Region

There are no major impoundments on the Mzimkulu River. The Gilbert Eyles Dam on a tributary of the Mzimkulu River is almost completely silted up. The eastern part of the Lower South Coast Water Supply System (from Hibberdene to Ramsgate, including Port Shepstone) is presently supplied from a run-of-river abstraction on the Mzimkulu River. The water is abstracted at the St Helen's Rock abstraction works near Port Shepstone and is further pumped to the Bhobhoyi WTP (owned and operated by Ugu District Municipality). The current water requirement at Port Shepstone is 16.6 million m^3/annum which is supplied from the Mzimkulu River abstraction works at St Helen's Rock.

The available run-of-river yield at the St Helen's Rock abstraction works is estimated at 18.3 million m^3/annum (excluding the Ecological Reserve) (**Table 11.14**). However, the construction of a weir across the Mzimkulu River at St. Helen's Rock would be required in order to access the available river flows during low river flow conditions.

Table 11.14 Yield Information for the St Helen's Rock Abstraction site (DWA 2012).

Site	River	Ecological Water Requirements	Present Day Yield (million m^3/year)
			Historical
St Helen's Rock	Mzimkulu	No	18.3 (50.1 Mℓ/day)
		Yes	3.3 (9 Mℓ/day)

The Amanzimnyama (Harding) Dam **(Figure 11.22, Table 11.15**) is located in the northern part of the Lower South Coast Water Supply System, on a tributary of the uMzimkhulwana River a tributary of the uMzimkhulu River. The dam is owned and operated by Ugu DM.

Figure 11.22 Amanzimnyama Dam

Table 11.15 Characteristics of Amanzimnyama Dam.

Catchment Details	
Incremental Catchment Area:	14.74 km^2
Total Catchment Area:	14.74 km^2
Mean Annual Precipitation:	803 mm
Mean Annual Runoff:	Approx. 0.5 million m^3 (Still to be verified)
Annual Evaporation:	1150 mm
Dam Characteristics	
Gauge Plate Zero:	849.2 mASL
Full Supply Level:	861.09 mASL
Spillway Height:	11.89 m
Net Full Supply Capacity:	0.656 million m^3
Dead Storage:	
Total Capacity:	0.656 million m^3
Surface Area of Dam at Full Supply Level:	0.11 km^2
Original Measured Dam Capacity	
Dam Type:	Earth fill
Crest Length:	Spillway Section: 181
Type of Spillway:	Open Channel
Capacity of Spillway:	
Date of Completion:	1995
Date of Last Area Capacity Survey:	2020
Date of Next Area Capacity Survey	2030

(e) Mtamvuna Region

There are no impoundments on the Mtamvuna River. The only significant abstraction that occurs is a run-of-river facility owned and operated by Ugu District Municipality to provide raw water to the Mtamvuna WTP. This plant supplies potable water south of Margate to Port Edward. The Mtamvuna abstraction works is located in the lower reaches of the Mtamvuna River. The Ludeke Dam on the Ludeke River was constructed by Umgeni Water, as an Implementing Agent for DWS, in 2014. This dam provides the resource for the Greater Mbizana Bulk Water Supply Scheme (**Figure 11.23**). **Table 11.16** outlines the yield information of Ludeke Dam, and characteristics of the dam are outlined in **Table 11.17**.

Table 11.16 Yield Information for the Ludeke Dam in the Mtamvuna Region.

Impoundment	River	MAR	Capacity (million m^3)	IFR Scenario	Yield (million m^3/annum)	Stochastic Yield (million m^3/annum)	Stochastic Yield (million m^3/annum)
					Historical	1:50	1:100
Ludeke Dam	Ludeke	16.9	14.95	With IFR	4.6 (12.6 Mℓ/day)	5.1 (14.0 Mℓ/day)	4.2 (11.5 Mℓ/day)
				Without IFR	7.5 (20.5 Mℓ/day)	8.5 (23.3 Mℓ/day)	7.5 (20.5 Mℓ/day)

Figure 11.23 Ludeke Dam.

Table 11.17 Characteristics of Ludeke Dam.

Catchment Details	
Incremental Catchment Area:	141 km^2
Total Catchment Area:	141 km^2
Mean Annual Precipitation:	979 mm
Mean Annual Runoff:	16.9 million m^3
Annual Evaporation:	1200 mm
Dam Characteristics	
Gauge Plate Zero:	752 mASL
Full Supply Level:	786.6 mASL
Spillway Height:	34.6 m
Net Full Supply Capacity*:	14.92 million m^3
Dead Storage:	0.030 million m^3
Total Capacity*:	14.95 million m^3 (October 2014)
Surface Area of Dam at Full Supply Level:	1.397 km^2
Dam Type:	Concrete
Material Content of a Dam Wall:	Clay-core rock fill embankment
Crest Length:	Spillway section : 222.36m Non-spillway section : N/A
Type of Spillway:	Uncontrolled ogee
Capacity of Spillway:	1285 m^3/s
Future Capacity Once Dam Wall has been Raised:	N/A
Date of Completion:	2014
Date of Last Area Capacity Survey:	2014
Date of Next Area Capacity Survey	2024

11.2.4 Operating Rules

(a) Mlazi/Lovu Water Resource Region

Raw water is supplied to the Amanzimtoti WTP from Nungwane Dam for treatment and distribution to the surrounding areas and to the Upper and Middle South Coast areas. This supply is limited and current demand exceeds the assured yield of the dam. Supply to Amanzimtoti is, therefore, being augmented with potable water from the Mgeni System (**Section 7.3.2 in Volume 2**) via the South Coast Augmentation Pipeline.

(b) uMkhomazi Region

Once the proposed Lower uMkhomazi Bulk Water Supply Scheme has been constructed then water stored in Ngwadini OCS Dam would be released to the river during the low flow periods and abstracted at a new weir near the existing Goodenough weir. This water will be pumped through a raw water delivery pipeline to the proposed WTP.

(c) Middle South Coast Region

The operating rules for this region consider three water resource systems, viz. uMkhomazi, uMuziwezinto/Mzimayi and Mpambanyoni Rivers as a single entity. After the commissioning of the South Coast Pipeline (SCP-1), the Craigieburn WTP, which received raw water from the uMkhomazi River, was closed and the system from the WTP is now fed with potable water from the SCP-1. There is an existing transfer link from the WTP to the uMzinto area, however, this link is currently not utilised due to the growth of demands in the Craigieburn area.

A schematic of this system is shown in **Figure 11.24**.

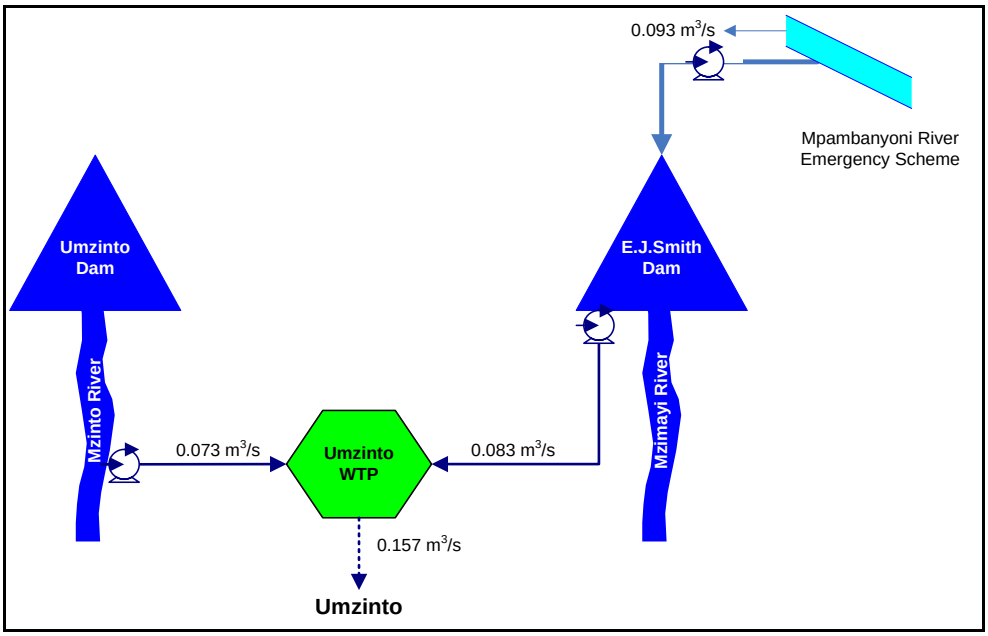


Figure 11.24 Schematic of the Middle South Coast system.

DWS commissioned a study to develop operating rules for the dams in this area and the recommended operating rules are described below.

(i) Water supply operating rules

Water from the Ellingham to Umzinto link, off the South Coast pipeline, should be used as soon as E.J. Smith and Umzinto Dams drop below full supply level. Further to this, storage in Umzinto Dam should be used ahead of using storage from EJ Smith Dam and operating levels for the top zones in both dams should be 70% and 90% of the Full Supply Capacity (FSC) for Umzinto and E.J. Smith dams, respectively.

(ii) Drought operating rules

The operating rules during a drought are shown below:

- At present restrictions would be required once the combined storage in Umzinto and E.J. Smith dams drops below 40%.
- The upper storage of both dams should be utilised first to delay the transfer volumes from the more expensive South Coast pipeline. Umgeni Water should revert to using the South Coast pipeline once the storage in the dams drop below the respective full supply levels.
- Consider utilising the Mpambanyoni Transfer Scheme once EJ Smith Dam reaches a level of 60%.

(iii) Mpambanyoni Emergency Abstraction Scheme

The Mpambanyoni Emergency Scheme was developed to pump water from the Mpambanyoni River to augment the Mzinto System (Umzinto and E.J. Smith dams) (**Figure 11.24)**. This 8 Mℓ/day scheme was used in 2014/2015 to augment the water resources of the EJ Smith Dam and was decommissioned March 2016 when the two dams reached full supply capacity.

This emergency scheme consisted of:

- A temporary abstraction chamber at an existing weir on the Mpambanyoni River.
- A temporary pump station, two stages of pumping from river abstraction to tank and then high lift pumps (8 Mℓ/day).
- A 5.1km transfer pipeline.

Given the increased frequency of the droughts in the Mzinto System, Umgeni Water has applied to DWS for a permanent or longer term water use licence which will allow for water to be used from the Mpambanyoni River as and when needed but most notably during drought periods.

(d) Mzimkulu Region

The water is abstracted at the St Helen's Rock abstraction works near Port Shepstone and is further pumped to the Bhobhoyi WTP via a raw water river abstraction (owned and operated by Ugu Municipality).

(e) Mtamvuna Region

There are no impoundments on the Mtamvuna River. Regarding the Ludeke Dam, the following actions are required:

- Provide releases from the dam to meet the requirements of downstream users and for environmental considerations.

11.3 Supply Systems

11.3.1 Upper South Coast Sub-System

(a) Amanzimtoti Water Treatment Plant

The Amanzimtoti WTP (**Figure 11.25**) receives raw water from the Nungwane Dam (**Figure 11.26**) which has a yield of 9.9 Mℓ/day (at a 98% assurance of supply). The design capacity of the WTP is 22 Mℓ/day, which is far greater than the assured yield of the water resource. Due to the raw water constraints it is necessary to augment this supply with potable water from the Wiggins WTP (**Section 7.3.1 (i) in Volume 2**) via the South Coast Augmentation Pipeline. Hence the Amanzimtoti WTP functions as both a distribution and balancing supply node. The characteristics of this WTP are shown in **Table 11.18**.

Figure 11.25 Amanzimtoti Water Treatment Plant.

Potable water is gravity fed from Amanzimtoti WTP along the 800 mm diameter steel South Coast Pipeline Phase 1 (SCP-1) (**Table 11.19**) to the uMnini Pump Station (**Table 11.20**) from where the water is pumped to the 15 Mℓ Quarry Reservoir (**Table 11.21**). eThekwini Municipality has connection points off this section of the SCP-1.

From Quarry Reservoir, potable water is gravity fed along the 600 mm diameter steel SCP-1 (**Table 11.19**) and terminates at the off-take to Scottburgh South Reservoir. Ugu District Municipality intends to link a number of their reservoir supply zones to this section of the SCP-1. Scottburgh South Reservoir currently serves as a distribution reservoir supplying Scottburgh Central and Freeland Park reservoirs (via the Freeland Park Pump Station).

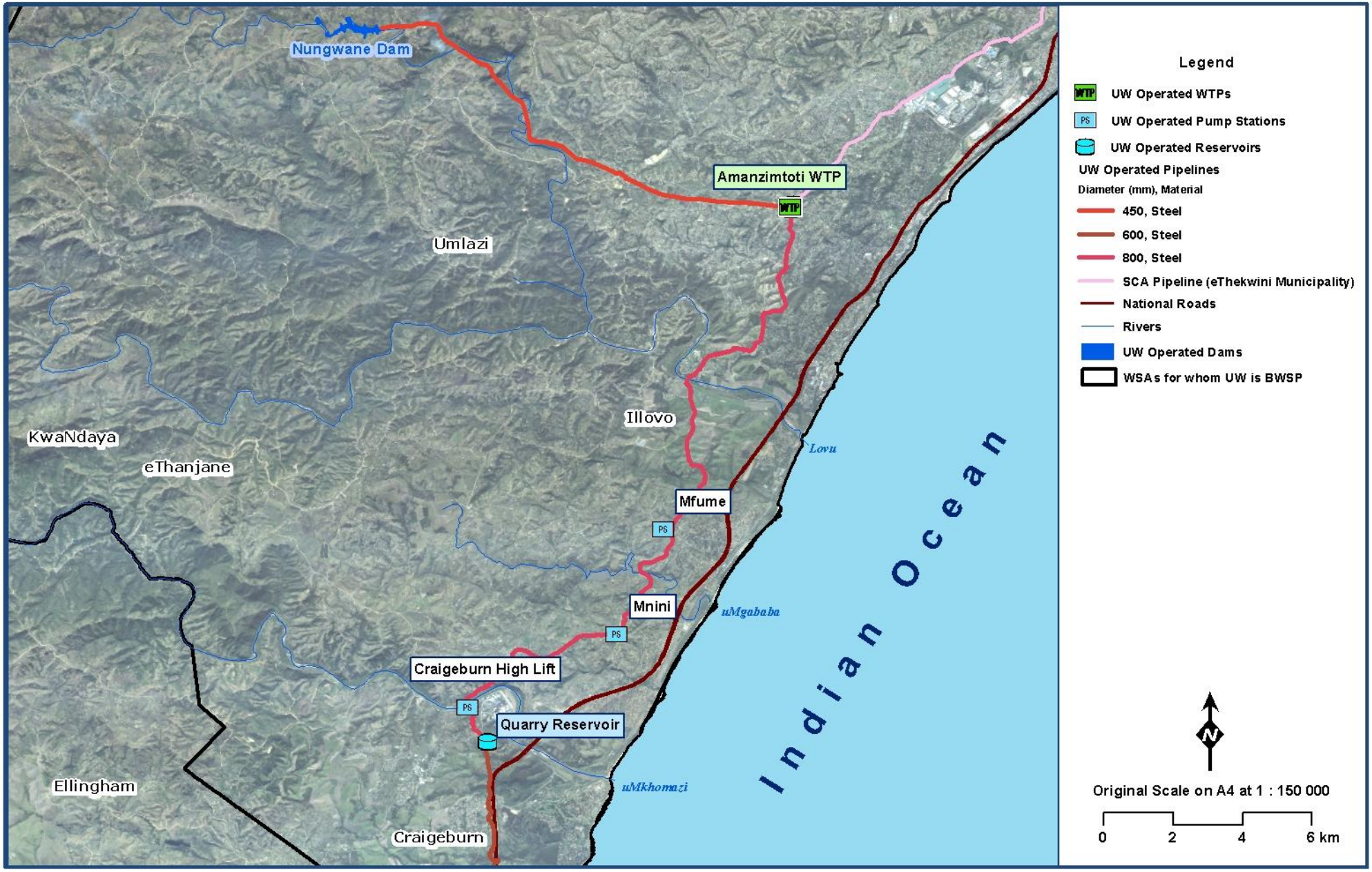


Figure 11.26 Amanzimtoti WTP to Quarry Reservoir.

Table 11.18 Characteristics of the Amanzimtoti WTP.

WTP Name:	Amanzimtoti WTP
System:	South Coast System
Maximum Design Capacity:	22 Mℓ/day
Current Utilisation:	15.0 Mℓ/day
Raw Water Storage Capacity:	None
Raw Water Supply Capacity:	27.5 Mℓ/day
Pre-Oxidation Type:	None
Primary Water Pre-Treatment Chemical:	Other
Total Coagulant Dosing Capacity:	Polymeric Coagulant
Rapid Mixing Method:	Flow Over Weir
Clarifier Type:	Circular Mechanical Scraper Clarifier
Number of Clarifiers:	3
Total Area of all Clarifiers:	1186.5 m^2
Total Capacity of Clarifiers:	11.5 Mℓ/day
Filter Type:	Other
Number of Filters:	13
Filter Floor Type	211.25 m^2
Total Filtration Area of all Filters	1.7 Mℓ/day
Total Filtration Design Capacity of all Filters:	5 m^3
Total Capacity of Backwash Water Tanks:	2000 kg/day of thin sludge
Total Capacity of Sludge Treatment Plant:	N/A
Capacity of Used Wash water System:	
Primary Post Disinfection Type:	Chlorine Gas
Disinfection Dosing Capacity:	500 kg/hr
Total Treated Water Storage Capacity:	34.3 Mℓ

(b) Craigieburn Water Treatment Plant

The Craigieburn WTP (**Figure 11.27**) was decommissioned with the commissioning of the SCP-1 (**IMP 2009**). Until recently (2019) the clear wells at Craigieburn WTP received potable water off the SCP-1 upstream of the Quarry Reservoir. Potable water was then pumped to the Craigieburn Reservoir Complex. From the Craigieburn Reservoir Complex, potable water is still pumped to the Midnite Café Reservoir, from where eThekwini Municipality sells the water to Ugu District Municipality. Potable water is also pumped from the Craigieburn Reservoir Complex, via the Willowglen Booster Pump Station, to Ugu District Municipality's Amahlangwa and Kwa Cele Reservoirs (**Figure 11.2**)**. Table 11.22** shows the details of these pump stations. The Craigieburn WTP clear wells and associated pump station were mothballed in October 2019. Potable water is currently supplied to the Craigieburn Reservoir Complex from the Singhs take-off, located downstream of the Quarry Reservoir on the SCP-1.

The 250 mm diameter pipeline that links Amahlangwa and Nkonko reservoirs serves as an emergency supply pipeline between Craigieburn Reservoir Complex and Umzinto WTP during below-average rainfall periods, and is currently used extensively (**Figure 11.2**).

Figure 11.27 Craigieburn Water Treatment Plant (decommissioned).

Table 11.19 Pipeline details: South Coast System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity (Mℓ/day)	Age (years)
South Coast	South Coast Pipeline Phase 1	Amanzimtoti WTP	Quarry Reservoir	22.00	800	Steel	65.14**	12
South Coast	South Coast Pipeline Phase 1	Quarry Reservoir	Scottburgh South Reservoir Sales Meter	16.00	600	Steel	48.86*	12
South Coast	South Coast Pipeline Phase 2a	Park Rynie Reservoir	Kelso Reservoir	4.50	600	Steel	37.0*	9
South Coast	Ellingham – Umzinto Link	Ellingham Reservoir	Umzinto WTP	5.80	250	Steel	6.40**	10
South Coast	Nungwane Raw Water Pipeline	Nungwane Dam	Amanzimtoti WTP	13.80	450	Steel	27.50*	1

* Capacity based on a velocity of 2 m/s
** Capacity based on a velocity of 1.5 m/s

Table 11.20 Pump details: Mnini Pump Station.

System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
South Coast	Mnini	2	1	KSB Omega 250/600	Mnini Pump Station	Quarry Reservoir	23	90	28.5

Table 11.21 Reservoir details: Upper and Middle South Coast Sub-Systems.

System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
South Coast	Amanzimtoti WTP	Amanzimtoti Reservoir 1	4.50	Balancing	131.8	128.8
South Coast	Amanzimtoti WTP	Amanzimtoti Reservoir 2	4.80	Balancing	131.8	128.8
South Coast	Amanzimtoti WTP	Amanzimtoti Reservoir 3	10.00	Balancing	131.8	125.1
South Coast	Amanzimtoti WTP	Amanzimtoti Reservoir 4	15.00	Balancing	132.1	125.1
South Coast	Mgobhozini	Mgobhozini Reservoir*	5.00	Distribution	182.2	176.6
South Coast	Quarry Reservoir	Quarry Reservoir	15.00	Balancing	155.0	147.4
South Coast	Scottburgh	Scottburgh South**	5.25	Distribution	102.3	98.5
South Coast	Scottburgh	Scottburgh Central**	2.71	Distribution	86.1	82.4
South Coast	Scottburgh	Freeland Park**	2.25	Terminal	86.4	81.7

* Reservoir owned and operated by eThekwini Municipality
** Reservoir owned and operated by Ugu District Municipality

Table 11.22 Pump details: Upper and Middle South Coast Sub-Systems.

System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
~~South Coast~~	~~Craigieburn **~~	~~2~~	~~1~~	~~KSB WKLn 80/4~~	~~Craigieburn WTP~~	~~Craigieburn Reservoir Complex~~	~~192.9~~	~~220~~	~~2.18~~
~~South Coast~~	~~Craigieburn **~~	~~1~~	~~1~~	~~KSB WKLn 80/3~~	~~Craigieburn WTP~~	~~Magabeni Res 1 and 2~~	~~150.3~~	~~192~~	~~0.71~~
South Coast	Mfume	1	1	KSB WKLn 125/4	South Coast Pipeline Phase 1	Mgobhozini Reservoir and Amagcino Reservoir	98.0	120	6.00
South Coast	Freeland Park*	1	1		Scottburgh Central Reservoir	Freeland Park Reservoir	4.0	10	2.00

* Pump Station owned and operated by Ugu District Municipality
** Pump Station mothballed, October 2019

11.3.2 Middle South Coast Sub-System

(a) Umzinto Water Treatment Plant

The Umzinto WTP (**Figure 11.28** and **Table 11.23**) receives its raw water from two sources. Water is either released into the Mzinto River from the Umzinto Dam, abstracted a few kilometres downstream through a sand-abstraction system at Esperanza and pumped to the WTP. Alternatively, raw water can be pumped to the WTP directly from the E.J. Smith Dam situated on the Mzimayi River (**Figure 11.29**, **Table 11.24** and **Table 11.25**). Raw water can also be supplied from both sources simultaneously.

The design capacity of the Umzinto WTP is 13.6 Mℓ/day, with provision for an upgrade, which will bring the total capacity to 18.2 Mℓ/day. The supply of treated water from the WTP is currently limited by the availability of raw water, viz. 8.9 Mℓ/day at a 98% assurance level. A temporary emergency scheme to augment the raw water supply from the E.J. Smith Dam was implemented by Umgeni Water during December 2014 as a drought mitigation measure. When required, this scheme has the capacity to transfer 8.0 Mℓ/day from the Mpambanyoni River into the E.J. Smith Dam.

The Umzinto WTP is owned by Ugu District Municipality, but operated by Umgeni Water under a management contract. Treated water from the WTP is sold to Ugu District Municipality "at the fence" and they are responsible for distribution within the entire network from the Umzinto WTP. The emergency pipeline as well as the pipeline details of the Umzinto Raw Water Supply System is provided in **Table 11.24**, and the pump and the reservoirs details in **Table 11.25** and **Table 11.26** respectively.

Figure 11.28 Umzinto Water Treatment Plant.

Table 11.23 Characteristics of the Umzinto WTP.

WTP Name:	Umzinto WTP
System:	South Coast System
Maximum Design Capacity:	13.6 Mℓ/day
Current Utilisation:	9.9 Mℓ/day
Raw Water Storage Capacity:	N/A
Raw Water Supply Capacity:	12.24 Mℓ/day
Pre-Oxidation Type:	$KMnO_4$
Primary Water Pre-Treatment Chemical:	Polymeric Coagulant
Total Coagulant Dosing Capacity:	None
Rapid Mixing Method:	Conventional Paddle Flash Mixer
Clarifier Type:	Clari-Flocculator
Number of Clarifiers:	3
Total Area of all Clarifiers:	387 m^2
Total Capacity of Clarifiers:	14 Mℓ/day at 1.5 m/hr up flow rate, 19 Mℓ/day at 2 m/hr up flow rate
Filter Type:	Constant Rate Rapid Gravity Filters
Number of Filters:	5
Filter Floor Type:	Monolithic
Total Filtration Area of all Filters:	127 m^2
Total Filtration Design Capacity of all Filters:	12 at 3.9 m/hr filtration rate, 15 Mℓ/day at 5 m/hr filtration rate
Total Capacity of Backwash Water Tanks:	Nil
Total Capacity of Sludge Treatment Plant:	Nil
Capacity of Used Wash water System:	Nil
Primary Post Disinfection Type:	Chlorine Gas
Disinfection Dosing Capacity:	12 kg Cl_2/hr including the Stand-By Unit
Disinfectant Storage Capacity:	
Total Treated Water Storage Capacity:	5 Mℓ

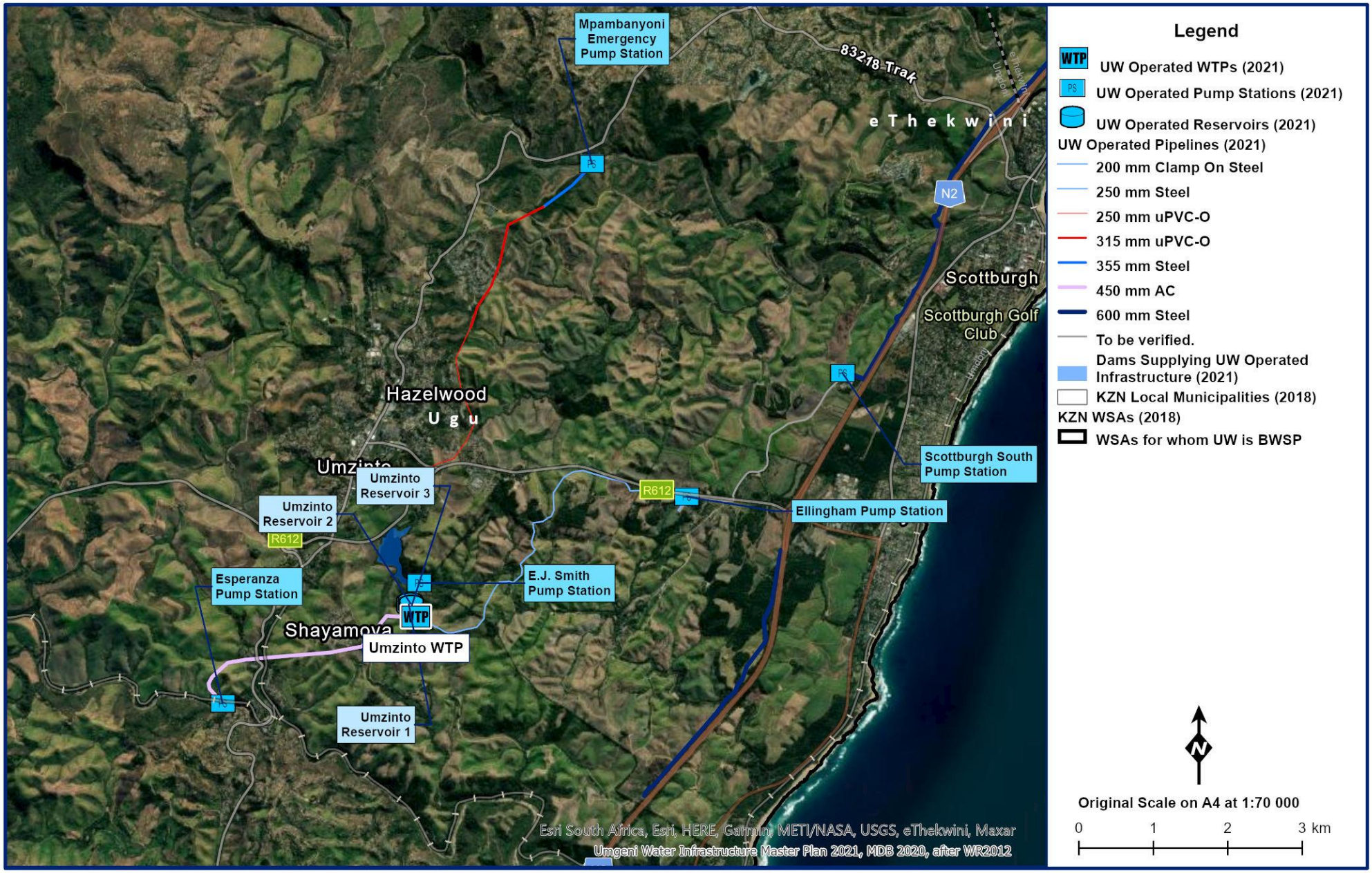


Figure 11.29 Umzinto Supply System.

Table 11.24 Pipeline details: Umzinto Raw Water Supply System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity (Mℓ/day)	Age (years)
Umzinto	Mpambanyoni Emergency	Mpambanyoni Temporary River Abstraction	E J Smith Dam	0.61 2.13 2.70	355 315 250	Steel uPVC-O uPVC-O	8.00**	6
Umzinto	Umzinto River rising main #	Umzinto River Abstraction	Umzinto WTP	3.5	450	AC	*9**	40
Umzinto	E J Smith Dam rising main #	E J Smith Dam Abstraction	Umzinto WTP	0.65 0.65 0.65	200 200 225	Clamp on Steel HDPE Polyprop	*8**	30 40 40

Pipeline owned by Ugu District Municipality and operated by Umgeni Water TBC
* Capacity based on a velocity of 2 m/s
** Capacity based on a velocity of 1.5 m/s

Table 11.25 Pump details: Umzinto Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
Umzinto	EJ Smith	4	1	KSB WKLn 65/3	E J Smith Dam	Umzinto WTP	135.00	165.8	1.44
Umzinto	Esperanza	3	1	KSB WKLn 80/3	Umzinto River Abstraction	Umzinto WTP	155.00	210	1.44
Umzinto	Mpambanyoni Emergency	1	0	KSB WKLn 150/5	Mpambanyoni Temporary River Abstraction	E J Smith Dam	163.20	171.1	8.00
Umzinto	St Patricks*	1	1		Umzinto WTP	Umzinto Heights Res	37.25	48	4.03
Umzinto	Nkonko*	1	1		Umzinto WTP	Hazelwood Res	51.25	98	2.00
Umzinto	Nkonko*	1	1		Umzinto WTP	Nkonko Res	12.85	20	3.00
Umzinto	Ifafa*	1	1		Umzinto WTP	Esperanza Res	5.25	10	0.50
Umzinto	Ifafa*	1	1		Umzinto WTP	Ifafa Res	4.25	5.5	2.11
Umzinto	Ellingham	1	1	KSB WKLn 125/4	Ellingham Reservoir	Umzinto WTP	70.75	118	4.50

* Pump Station owned and operated by Ugu District Municipality

Table 11.26 Reservoir details: Umzinto Supply System.

Supply System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
Umzinto	Umzinto WTP	Umzinto Reservoir 1	0.90	Balancing	204.8	201.75
Umzinto	Umzinto WTP	Umzinto Reservoir 2	2.10	Balancing	204.8	201.75
Umzinto	Umzinto WTP	Umzinto Reservoir 3	2.00	Balancing	204.8	201.75
Umzinto	Umzinto	Umzinto Heights**	5.00	Terminal	225.3	220.8
Umzinto	Umzinto	Hazelwood**	0.68	Terminal	256.0	253.18
Umzinto	Umzinto	Nkonko**	5.00	Terminal	217.6	212.95
Umzinto	Umzinto	Esperanza**	0.30	Terminal	210.0	207.00
Umzinto	Umzinto	Ifafa**	1.00	Terminal	209.0	206.00
Umzinto	Park Rynie	Ellingham**	2.00	Distribution	134.0	129.30
Umzinto	Park Rynie	Park Rynie**	0.90	Terminal	68.6	65.84
Umzinto	Park Rynie	Cabana**	1.00	Terminal	86.0	82.00
Umzinto	Kelso	Kelso**	0.25	Terminal	80.8	77.77
Umzinto	Pennington	Pennington**	3.00	Distribution	93.0	89.30
Umzinto	Pennington	Umdoni**	1.00	Terminal	130.0	126.00
Umzinto	Pennington	Hilltops**	2.00	Terminal	86.0	83.00
Umzinto	Pennington	Bazley**	1.00	Terminal	76.0	72.45

** Reservoir owned and operated by Ugu District Municipality

(b) Umzinto Supply System

Ugu District Municipality supplies water from the Umzinto WTP to consumers through their own bulk water infrastructure. Potable water is supplied from Umzinto WTP to (**Table 11.25**):

- Umzinto Heights Reservoir via the St Patrick's Booster Pump Station,
- Hazelwood and Nkonko reservoirs via the Nkonko Booster Pump Station, and
- Esperanza and Ifafa reservoirs via the Ifafa Booster Pump Station.

Potable water from the Amanzimtoti (Mgeni) system is gravity fed from the Quarry Reservoir to Scottburgh South Reservoir along the SCP-1. Scottburgh Central is gravity fed from this reservoir and the Ellingham Reservoir is supplied via the Scottburgh South Pump Station, from where water supply is gravity fed to the Park Rynie and Pennington Reservoirs, and pumped to Umzinto WTP via the Ellingham Pump Station. The SCP-1 Pipeline terminates at the off-take chamber to the Scottburgh South Reservoir. A 2.7 km section from this termination point to the start of the existing 600 mm diameter Kelso-Pennington pipeline (SCP-2A) will be constructed under the proposed SCP-2B pipeline project. The existing SCP-2A (Kelso-Pennington) Pipeline supplies the Cabana and Kelso Reservoirs and further to Pennington Reservoir. Potable water is then pumped via the Pennington Pump Station to the Umdoni Reservoir. A 200 mm diameter pipeline along Dolphin Drive in Pennington also supplies potable water to the Hilltops and Bazley reservoirs. The 200 mm diameter link between Bazley Reservoir and Elysium Reservoir, which is supplied from the Mtwalume WTP, is used to supplement the supply of Mtwalume WTP (**Figure 11.2**).

(c) Mtwalume Water Treatment Plant

The Mtwalume WTP (**Figure 11.30**) receives its raw water from a sand abstraction system in the Mtwalume River. The design capacity of Mtwalume WTP has been upgraded from 4.5 Mℓ/day to 7.5 Mℓ/day. As with the Umzinto WTP, the Mtwalume WTP and bulk water supply infrastructure is owned by Ugu District Municipality with Umgeni Water operating the WTP under a management contract. Umgeni Water installed a 2.0 Mℓ/day package treatment plant in December 2015 to help alleviate the Mtwalume WTP over utilisation. This provided the opportunity for scheduled maintenance on the filters and auxiliary equipment. The package plant configuration is such that the treatment capacity may be increased to 9.5 Mℓ/day. However, the raw water supply is constrained by the run-of-river yield (see **Section 11.2**). Treated water is sold by Umgeni Water to Ugu District Municipality "at the fence", and Ugu District Municipality is responsible for the entire distribution network within the Mtwalume Supply System. The characteristics of Mtwalume WTP are described in **Table 11.27**, the pump details for this sub-system in **Table 11.28** and the reservoirs details in **Table 11.29**.

Figure 11.30 Mtwalume Water Treatment Plant.

Table 11.27 Characteristics of the Mtwalume WTP.

WTP Name:	Mtwalume WTP
System:	Mtwalume WTP Supply System
Maximum Design Capacity:	7.5 Mℓ/day
Current Utilisation:	12.3 Mℓ/day
Raw Water Storage Capacity:	0.11 Mℓ/day
Raw Water Supply Capacity:	8.4 Mℓ/day
Pre-Oxidation Type:	Pre chlorination
Primary Water Pre-Treatment Chemical:	Polymeric Coagulant
Total Coagulant Dosing Capacity:	Other
Rapid Mixing Method:	Conventional Paddle Flash Mixer
Clarifier Type:	Dortmund Type Clarifier
Number of Clarifiers:	3
Total Area of all Clarifiers:	324 m^2
Total Capacity of Clarifiers:	16 at Rise Rate of 2 m/hr
Filter Type:	Constant Rate Rapid Gravity Filters
Number of Filters:	3
Total Filtration Area of all Filters	72 m^2
Total Filtration Design Capacity of all Filters:	15.552 Mℓ/day
Primary Post Disinfection Type:	Chlorine Gas
Disinfection Dosing Capacity:	8 kg Cl_2/hr
Total Treated Water Storage Capacity:	0.9 Mℓ

Table 11.28 Pump details: Mtwalume Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
Mtwalume	Mtwalume WTP	2	1	KSB ETA New 125-315	Mtwalume River Abstraction	Mtwalume WTP	112.0	125	15.55
Mtwalume	Mtwalume WTP	1	1	KSB WKLn 80/3	Mtwalume WTP	Mnafu Reservoir	140.5	220	2.50
Mtwalume	Mtwalume WTP	1	1	KSB MIC 50/7A	Mtwalume WTP	Qoloqolo Reservoir	180.0	250	0.56
Mtwalume	Mtwalume WTP	3	1	KSB WKLn 125/3	Mtwalume WTP	Ellysium Reservoir	81.0	100	4.80
Mtwalume	Mtwalume*	1	1		Mtwalume Reservoir	Koelwaters Reservoir	18.75	30	0.80

* Pump Station owned and operated by Ugu District Municipality

Table 11.29 Reservoir details: Mtwalume Supply System.

Supply System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
Mtwalume	Mtwalume WTP	Mtwalume WTP Reservoir	0.90	Balancing	22.5	19.00
Mtwalume	Elysium	Elysium**	5.50	Distribution	103.5	100.69
Mtwalume	Mtwalume	Mtwalume**	0.25	Distribution	85.3	82.50
Mtwalume	Mtwalume	Koelwaters**	1.00	Terminal	104.0	101.00
Mtwalume	Mnafu	Mnafu**	3.00	Distribution	163.0	160.00
Mtwalume	Mathulini	Mathulini**	0.50	Terminal	112.5	109.50
Mtwalume	Qoloqolo	Qoloqolo**	0.50	Terminal	202.5	199.50

** Reservoir owned and operated by Ugu District Municipality

(d) Mtwalume Supply System

It is important to take cognisance of the fact that the bulk supply system from the Mtwalume WTP is owned and operated by Ugu District Municipality, and hence Umgeni Water's own operations and future augmentation plans are integrated into this system.

Potable water is supplied from Mtwalume WTP via the Mtwalume WTP Pump Station to the Qoloqolo, Elysium and Mnafu reservoirs. Potable water is then gravity fed from the Mnafu Reservoir to the Mathulini Reservoir.

Potable water is gravity fed from the Elysium Reservoir to the Mtwalume Reservoir and then the water is pumped via the Mtwalume Pump Station to the Koelwaters Reservoir (**Figure 11.2**).

11.3.3 Lower South Coast Sub-Region

The Lower South Coast sub-region (**Figure 11.5**) is predominately supplied with bulk treated water from the Bhobhoyi WTP (current capacity of 81 Mℓ/day with a planned increase in capacity to 108 Mℓ/day) located 8 km inland of Port Shepstone, and from the uMtamvuna WTP (20 Mℓ/day, currently being upgraded to 30 Mℓ/day) located 25 km inland of Port Edward. The Bhobhoyi and uMtamvuna WTP's receive water from the uMzimkhulu and uMtamvuna Rivers respectively (**Section 11.2.3(d) and Section 11.2.3(e**)). Both WTP's are owned and operated by Ugu District Municipality. In addition, there are a number of smaller WTP's in the area, such as those supplying Harding and Dududu (**Figure 11.31**).

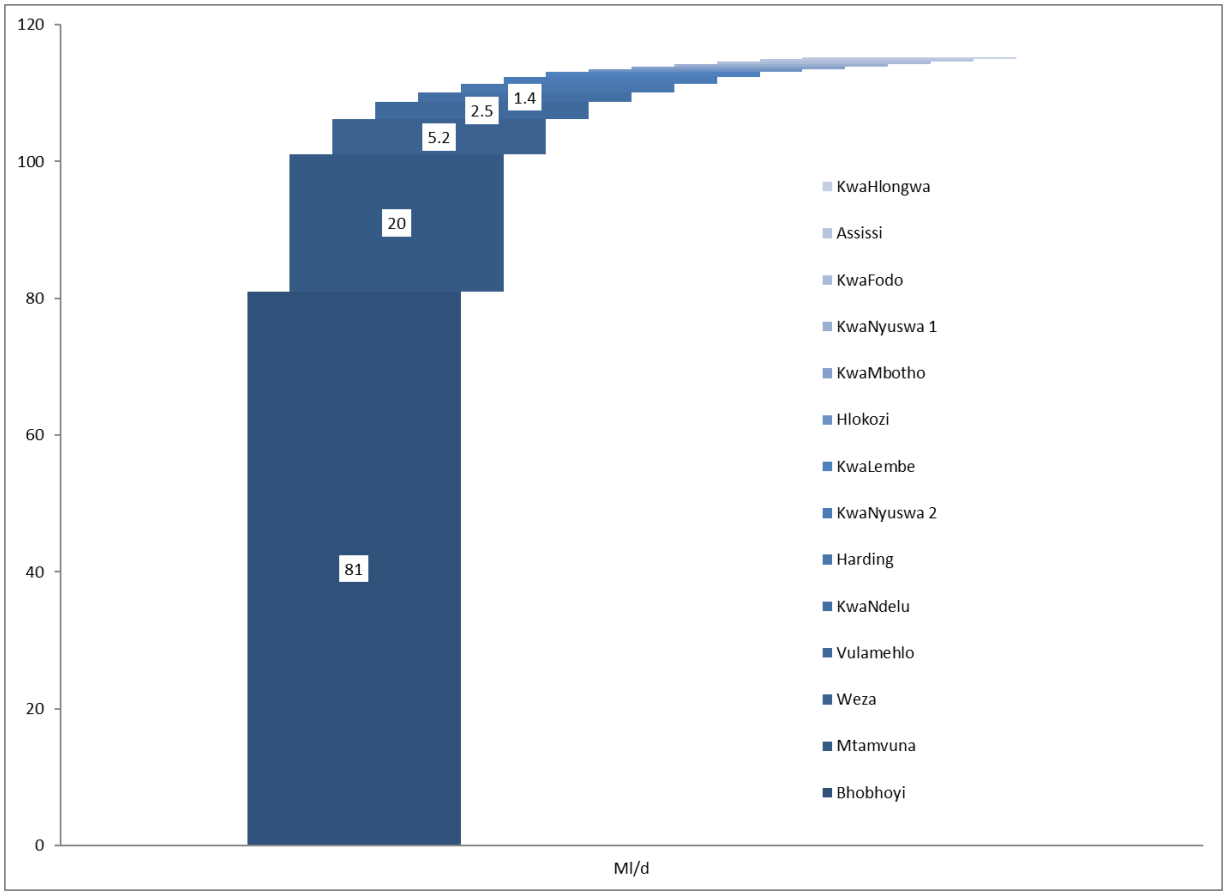


Figure 11.31 Water Treatment Plants Capacity.

With reference to **Figure 11.31**, the Lower South Coast Sub-Region is served by more than 14 water treatment plants ranging from 81 Mℓ/day to 0.24 Mℓ/day in size. Ideally, the Ugu DM aims to integrate individual water schemes into sustainable regional schemes. The major regional schemes which comprise of 95% of the existing treatment capacity, include:

- uMzimkhulu Supply System (Ray Nkonyeni LM)
- uMtamvuna Supply System (Ray Nkonyeni LM)
- Harding-Weza Supply System (uMuziwabantu LM)

- Vulamehlo Supply System (uMdoni LM)

Umgeni Water owns and operates the Mhlabatshane WTP. Treated water is sold by Umgeni Water to both Ugu and Harry Gwala District Municipalities "at the fence". Ugu District Municipality is responsible for the entire distribution network within the Mhabatshane Supply System.

(a) Mhlabatshane Supply System (Operated by UW)

Umgeni Water commissioned the Mhlabatshane WTP in October 2014; which it owns and operates in the Lower South Coast area. Umgeni Water's involvement relates to bulk water supply provision and Ugu District Municipality is responsible for the reticulation aspects. The Mhlabatshane Supply System supplies the inland rural areas of the Umzumbe and Ray Nkonyeni Local Municipalities.

Raw water is pumped from the dam (**Figure 11.32**) to the Mhlabatshane WTP situated in close proximity to a command reservoir. Potable water is pumped from the WTP to the command reservoir and is then sold to Ugu District Municipality for reticulation through an extensive gravity-fed network to the various communities in the area. Some of the reticulation components currently exist as stand-alone schemes, with the remainder in the process of being constructed. Following the revised demarcation of District Municipal Boundaries, some of the areas supplied by the Mhlabatshane WTP (Ndwebu) now fall within the Harry Gwala District Municipality. This scheme will therefore be regarded as a "regional scheme" with more than one WSA being supplied from the same source.

A package plant that was used prior to the commissioning of the Mhlabatshane WTP remains on site as a "back-up" for when demand exceeds the WTP capacity (this package plant stopped operating in 2014/2015). The demand from the WTP reached capacity during 2018, four years after commissioning, and the plan is to now utilise the water treatment package plant during scheduled maintenance on the filters and auxiliary equipment.

Details of the water treatment plant (**Table 11.30**), pipelines (**Table 11.31**), pumps (**Table 11.32**) and reservoirs (**Table 11.33**) are given below.

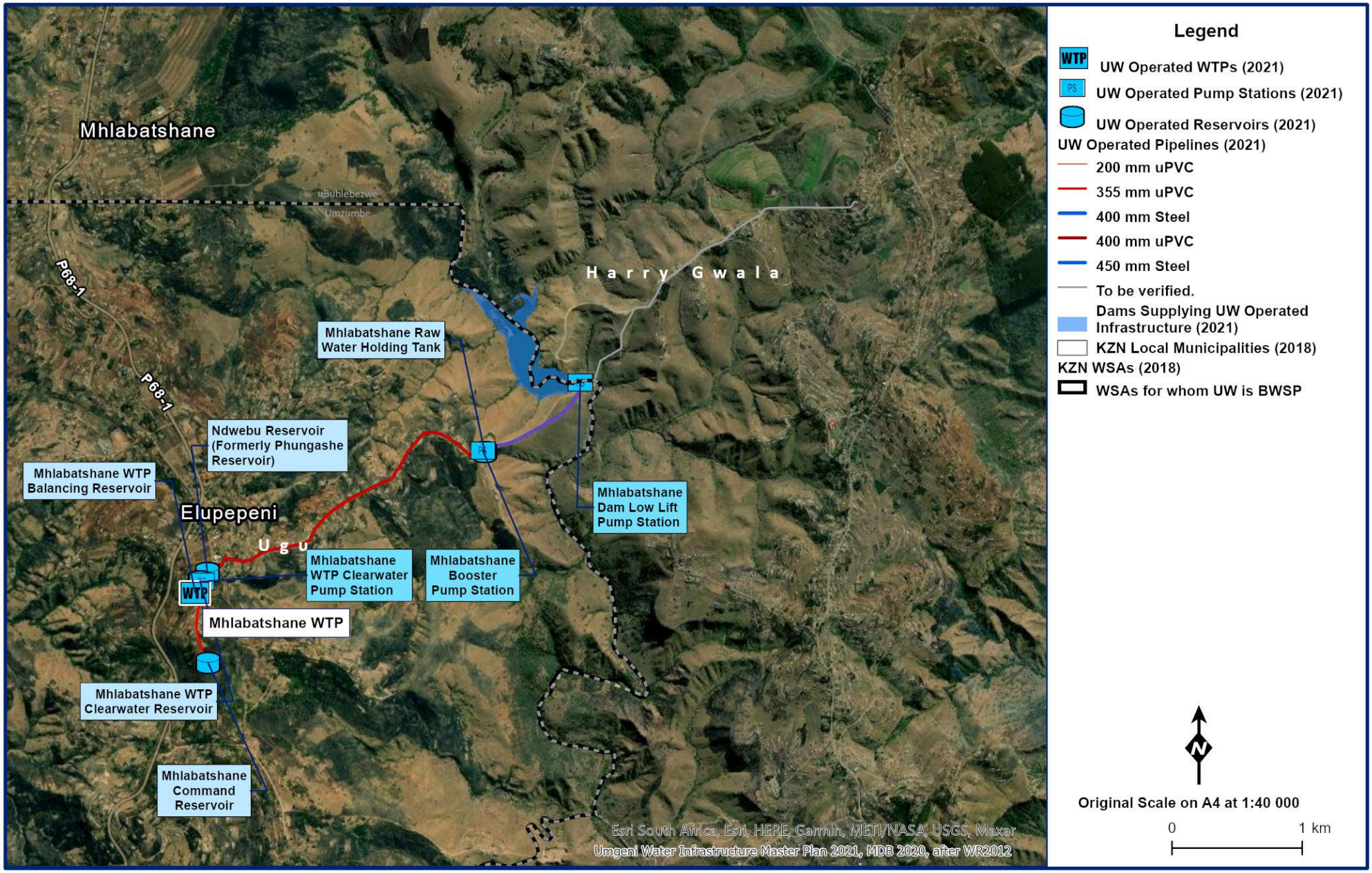


Figure 11.32 Mhlabatshane Supply System.

Table 11.30 Characteristics of Mhlabatshane WTP.

WTP Name:	Mhlabatshane WTP
System:	Mhlabatshane Supply System
Maximum Design Capacity:	4 Mℓ/day
Current Utilisation:	6.1 Mℓ/d
Raw Water Storage Capacity:	0.5 Mℓ/day
Raw Water Supply Capacity:	8 Mℓ/day
Pre-Oxidation Type:	Pre chlorination
Primary Water Pre-Treatment Chemical:	Aluminium Sulphate
Total Coagulant Dosing Capacity:	150 mg/ℓ
Rapid Mixing Method:	Flow Over Hydraulic weir
Clarifier Type:	Dortmund – confirmed off design report
Number of Clarifiers:	4
Total Area of all Clarifiers:	144 m^2
Total Capacity of Clarifiers:	4 Mℓ/d
Filter Type:	Rapid Gravity Sand Filters
Number of Filters:	4
Filter Floor Type:	Monolithic
Total Filtration Area of all Filters:	65 m^2
Total Filtration Design Capacity of all Filters:	8 Mℓ/day
Total Capacity of Backwash Water Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Capacity of Used Wash Water System:	
Primary Post Disinfection Type:	Chlorine Gas
Disinfection Dosing Capacity:	2.5 kg/hr (max)
Disinfectant Storage Capacity:	Stored in 70 kg Cylinders
Total Treated Water Storage Capacity:	2.5 Mℓ

Table 11.31 Pipeline Details: Mhlabatshane Supply System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity* (Mℓ/day)	Age (years)
Mhlabatshane	Gravity main	Mhlabatshane WTP	Ndwebu Tie-in at the Dam site	3.8	200	Steel	1.24	9
Mhlabatshane	Rising main	Dam	Booster Pump station	1.0	450	Steel	10.25	9
Mhlabatshane	Rising Main	Booster Pump station	Mhlabatshane WTP	2.7	400	PVC	10.1	9
Mhlabatshane	Rising Main	Mhlabatshane WTP	Command Reservoir	0.8	350	Steel	7.86	9

* Capacity based on a velocity of 2 m/s

Table 11.32 Pump Details: Mhlabatshane Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
Mhlabatshane	Dam low lift pump station	2	1	KSB WKLn 150/4	Mhlabatshane Dam	Raw Water Tank	156.0	NA	10.0
Mhlabathsane	Booster	2	1	KSB WKLn 150/4	Raw Water Tank (500 kℓ concrete reservoir)	500 kℓ Reservoir at WTP	149.0	NA	10.0
Mhlabathshane	Clean water pump station	2	1	KSB ETA 100-50/2	1750 Kℓ Potable reservoir	2 Mℓ Command Reservoir	51.0	NA	7.8

Table 11.33 Reservoir Details: Mhlabatshane Supply System.

System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
Mhlabatshane	Booster Pump Station/Phungashe	Booster Pump station	0.5	Balancing	738.0	735.5
Mhlabatshane	Mhlabathshane WTP	Potable Water Pump station	1.75	Distribution	863.1	Unknown
Mhlabatshane	Mhlabatshane WTP	Inlet Works	0.5	Balancing	866.8	864.3
Mhlabatshane	MTN Tower	Command	0.5 2.0	Distribution	911.5 909.2	908.3 905.1

(b) uMzimkhulu Supply System (Operated by Ugu DM)

Ugu DM owns and operates the uMzimkhulu Supply Scheme which supplies the coastal towns from Hibberdene in the north, through to Port Shepstone and Shelly Beach going south, and further to the coastal towns of Margate and Ramsgate. The uMzimkhulu Supply System also supplies the inland rural areas of the Ray Nkonyeni Local Municipality which include Gamalakhle, Murchison, kwaMavundla, Loisiana and kwaMadlala.

Raw water is pumped from the St Helen's Rock abstraction works (**Figure 11.33**) to the Bhobhoyi WTP, via an off-channel storage dam. Potable water is gravity fed or pumped from the WTP into the bulk service storage infrastructure and bulk distribution networks. Thereafter, potable water is reticulated through an extensive gravity and pumped reticulation network. During April 2019 Ugu DM commissioned the upgrading of the Bhobhoyi WTP from 54 Mℓ/day to the current 81 Mℓ/day. The WTP is planned to have an ultimate capacity of 108 Mℓ/day.

Details of the water treatment plant (**Table 11.34),** primary bulk pipelines (**Table 11.35**), pump stations (**Table 11.36**) and primary bulk reservoirs (**Table 11.37**) are provided below.

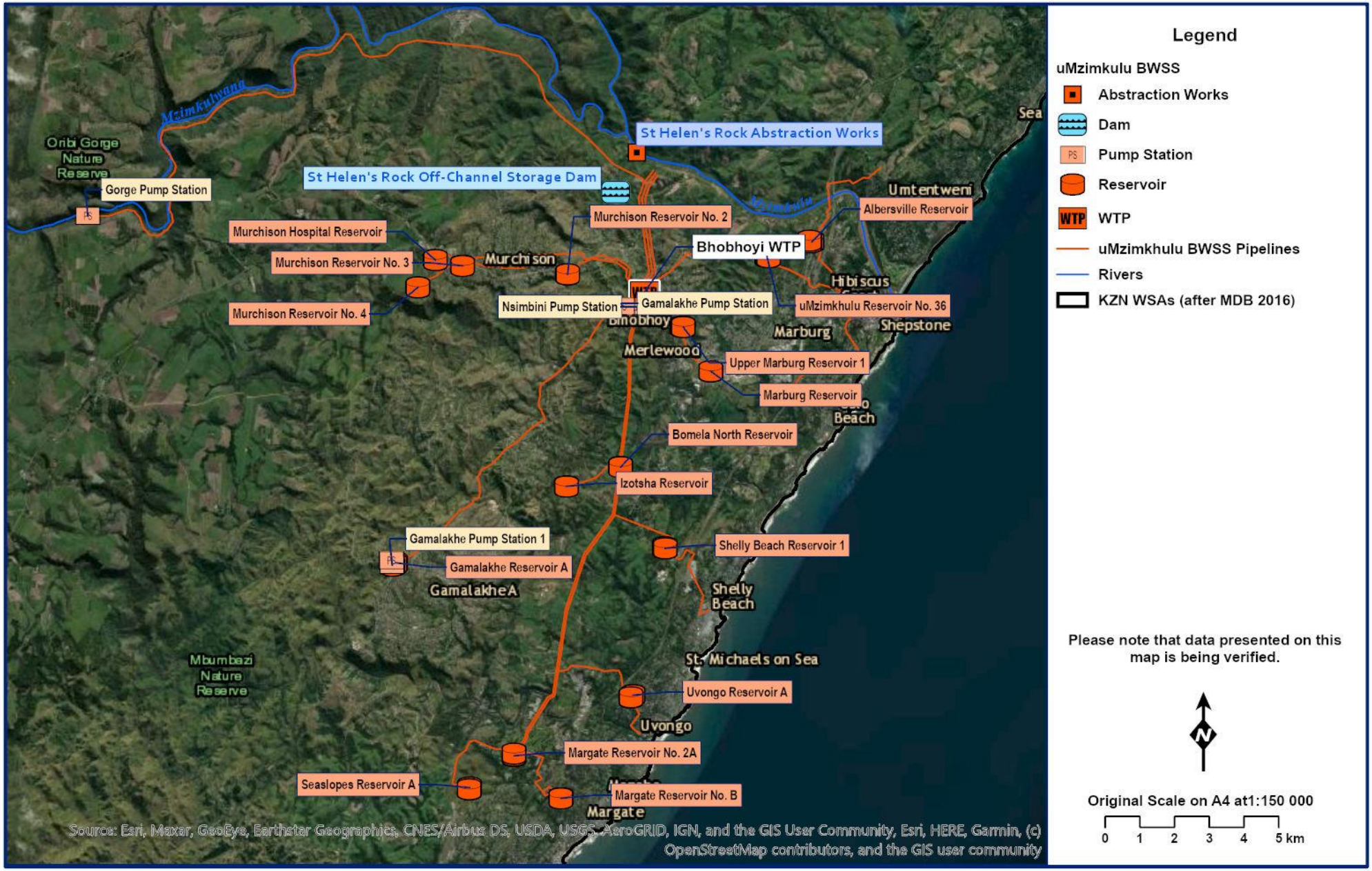


Figure 11.33 uMzimkhulu Supply System.

Table 11.34 Characteristics of Bhobhoyi WTP.

WTP Name:	Bhobhoyi WTP
System:	uMzimkhulu Supply System
Maximum Design Capacity:	81 Mℓ/day
Current Utilisation:	45.7 Mℓ/d
Raw Water Storage Capacity:	886 Mℓ/day
Raw Water Supply Capacity:	81 Mℓ/d
Pre-Oxidation Type:	Nil
Primary Water Pre-Treatment Chemical:	Polyelectrolyte 8730
Total Coagulant Dosing Capacity:	150 mg/ℓ
Rapid Mixing Method:	Baffled Channel
Clarifier Type:	Paterson
Number of Clarifiers:	4 (1-rectangular and 3-circular)
Total Area of all Clarifiers:	1680 m^2
Total Capacity of Clarifiers:	76 Mℓ/d
Filter Type:	Rapid Gravity Sand Filters
Number of Filters:	15
Filter Floor Type:	Monolithic
Total Filtration Area of all Filters:	422 m^2
Total Filtration Design Capacity of all Filters:	75 Mℓ/day
Total Capacity of Backwash Water Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Capacity of Used Wash Water System:	
Primary Post Disinfection Type:	Chlorine Gas
Disinfection Dosing Capacity:	6.0 kg/hr (max)
Disinfectant Storage Capacity:	Stored in 70 kg Cylinders
Total Treated Water Storage Capacity:	9.0 Mℓ

Table 11.35 Pipeline Details: uMzimkhulu Supply System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity* (Mℓ/day)	Age (years)
uMzimkhulu – Raw	Rising Main	St Helens Rock Abstraction Works	Bhobhoyi WTP (via the OCS Dam)	3.8	700 465	Steel Steel	50.0 22.0	21 36
uMzimkhulu – East	Gravity Main	Bhobhoyi WTP	uMzimkhulu / Albersville Reservoir	3.4 / 3.3 / 3.3	400 / 300 / 250	Steel	8.5 to 21.7	11 38 38
uMzimkhulu – South Line	Rising Main	Bhobhoyi WTP	Izotsha / Sportsfield Shelly Beach 1 & 2	5.7 / 8.9 / 5.7 / .8 / 1.3	600 / 600 / 375 / 300 / 100	Steel	1.0 to 36.7	11 40 40
uMzimkhulu -	Rising Main	Bhobhoyi WTP	Betania Reservoir	1.8	315	Steel	10.1	Unknown
uMzimkhulu - SW	Rising Main	Bhobhoyi WTP	Bomela North Reservoir	5.3	250	Steel	6.4	25
uMzimkhulu - West	Rising Main	Bhobhoyi WTP	Murchison Reservoir 2 / 3 / 4 / Hospital	2.5/ 3.4 / 1.4 /5.9	200	Steel	4.1	28

* Capacity based on a velocity of 2 m/s gravity and 1.5 m/s pumped

Table 11.36 Pump Details: uMzimkhulu Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
uMzimkhulu	St Helens Rock Low Lift Pump Station	6	1	Gorman-Rupp 11A2B60-B (old 4 off) Gorman-Rupp 11A2D60-B (new 2 off)	uMzimkhulu River	Raw Water Tank	15.0	22.0	18.0 23.3
uMzimkhulu	St Helens Rock High Lift Pump Station	1	1	Sulzer SM 303-800	St Helens Pump Station	OCS Dam / WTP	165.0	180.0	59.0
uMzimkhulu	St Helens Rock High Lift Pump Station	3	1	Sulzer BDC 300-400-d2s/33	St Helens Pump Station	OCS Dam / WTP	165.0	183.0	21.6
uMzimkhulu	Marburg BPS	1	1	KSB ETA 150/4	Bhobhoyi WTP	Marburg		48.0	6.5
uMzimkhulu	uMmzimkhulu BPS	1	1	KSB ETA 200-40D	Bhobhoyi WTP	uMzimkhulu Reservoir		50.0	13.0
uMzimkhulu	Seaslopes A & B BPS	2	1	KSB ETA 250-40D	Bhobhoyi WTP	Seaslopes Reservoir (375mm dia. Seaslope, Uvongo & Shelly Beach Reservoirs)		32.0	19.9
uMzimkhulu	Nsimbini	1	1	KSB WKLn 80/4	Bhobhoyi WTP	0.1Mℓ Bomela North Reservoir	264.0	284.0	2.7
uMzimkhulu	Murchison	2	1	KSB WKLn 100/6	Bhobhoyi WTP	2 Mℓ Command Reservoir		136.0	2.1

Table 11.37 Reservoir Details: uMzimkhulu Supply System.

System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
uMzimkhulu	Bhobhoyi	uMzimkhulu Off-Channel Storage Dam	886	Balancing	190.0	169.6
uMzimkhulu	Bhobhoyi WTP	Circular Square	4.5 4.5	Balancing	152.0 153.5	145.8 149.2
uMzimkhulu	Umtentweni	Barrow Green	2.2 1.14	Distribution	11A6.4	Unknown
uMzimkhulu	Albersville	Res 12A Res 12B	4.5 10.0	Distribution	11A6.4 11A7.0	Unknown
uMzimkhulu	Protea Park	uMzimkhulu	7.3	Balancing	133.4	Unknown
uMzimkhulu	Marburg	Upper Marburg A Upper Marburg B	4.5 4.5	Balancing	11A3.4	Unknown
uMzimkhulu	Shelly Beach	Shelly Beach A Shelly Beach B	2.5 5.0	Distribution	11A6.0	Unknown
uMzimkhulu	Uvongo	Uvongo A Uvongo B	2.5 2.0	Distribution	95.3	Unknown
uMzimkhulu	Izotsha	Izotsha	0.2	Distribution	168.8	Unknown
uMzimkhulu	Sports & Leisure	Sportsfield	4.4 4.4	Distribution	284.0	280.0
uMzimkhulu	Betania Gardens	Betania	0.1	Distribution	N/A	Unknown
uMzimkhulu	Insinbini	Bomela North	0.1	Distribution	286.7	Unknown
uMzimkhulu	Murchison	Murchison 2	0.5	Distribution	217.5	212.6
uMzimkhulu	Murchison	Murchison 3	1.0	Distribution	344.4	339.7
uMzimkhulu	Murchison	Murchison 4	0.5	Balancing / Distribution	384.4	379.0
uMzimkhulu	Murchison	Murchison Hospital	0.6	Distribution	384.1	Unknown

(c) uMtamvuna Supply System (Operated by Ugu DM)

Ugu DM owns and operates the uMtamvuna Supply Scheme which supplies the:

- coastal towns from Umtamvuna / Port Edward in the south up to Southbroom in the north,
- coastal areas Marina Beach, Palm Beach, Leisure Crest, Portobello and Trafalgar
- inland rural areas of kwaXolo, kwaNzimakwe and Izingolweni.

Raw water is pumped from an abstraction works located in the uMtamvuna River **(Figure 11.34**) to the uMtamvuna WTP, via an off-channel storage dam (180 Mℓ storage capacity). Potable water is gravity fed or pumped from the WTP into the bulk service storage infrastructure and bulk distribution networks. Thereafter, potable water is reticulated through an extensive gravity and pumped fed network. The uMtamvuna WTP has been designed for a capacity increase from the current 20 Mℓ/day to 50 Mℓ/day. The plant upgrade to 30 Mℓ/day has not yet been commissioned due to delays in the electricity supply upgrade.

Details of the water treatment plant (**Table 11.38**), pipelines (**Table 11.39**), pump stations (**Table 11.40**) and reservoirs (**Table 11.41**) are provided below.

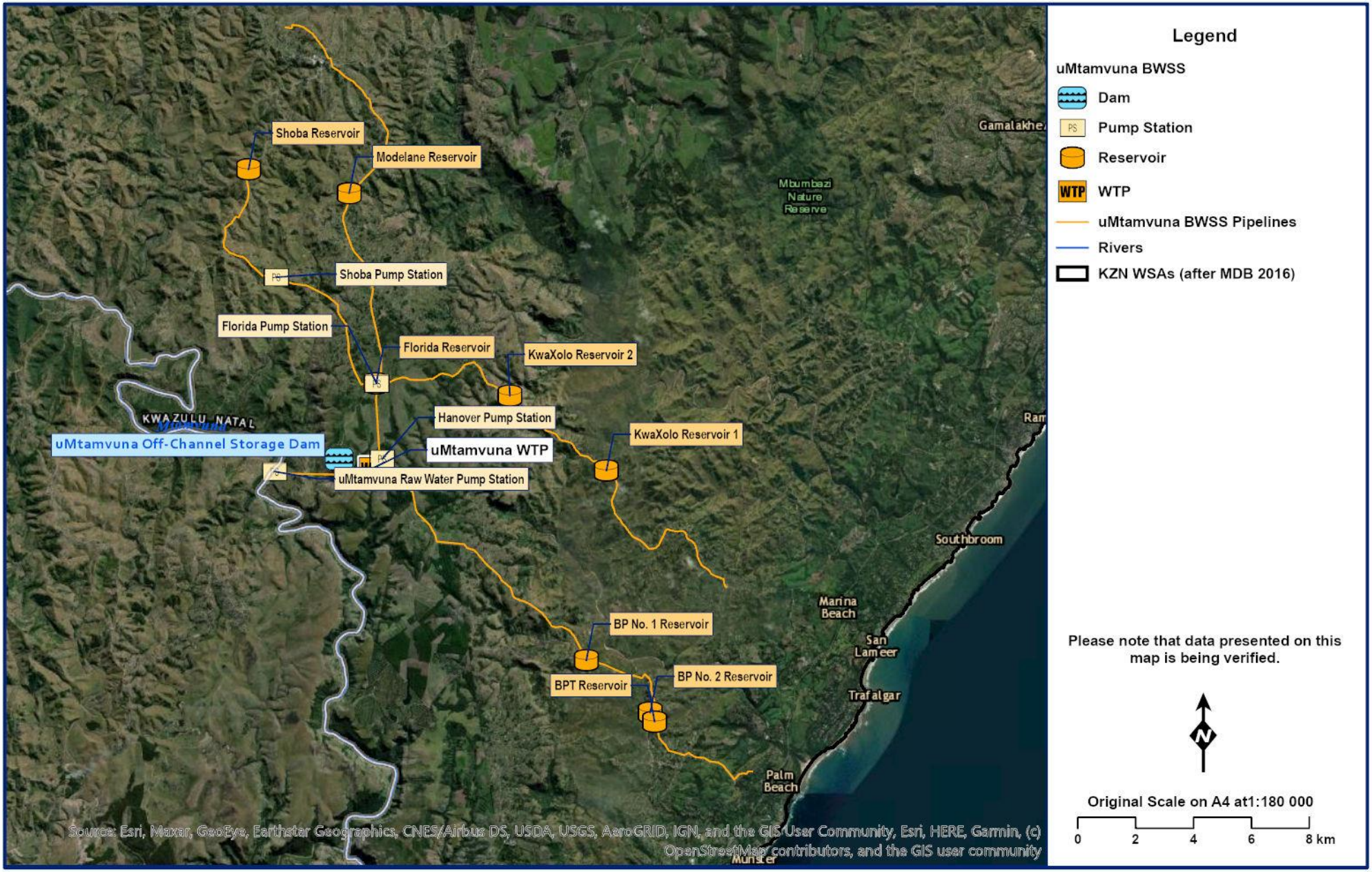


Figure 11.34 uMtamvuna Supply System.

Table 11.38 Characteristics of uMtamvuna WTP.

WTP Name:	uMtamvuna WTP
System:	uMtamvuna Supply System
Maximum Design Capacity:	20(30) Mℓ/day
Current Utilisation:	18.4 Mℓ/d
Raw Water Storage Capacity:	180 Mℓ/day
Raw Water Supply Capacity:	20(36) Mℓ/day
Pre-Oxidation Type:	Pre chlorination
Primary Water Pre-Treatment Chemical:	Polyelectrolyte 8730
Total Coagulant Dosing Capacity:	150 mg/ℓ
Rapid Mixing Method:	Raw water inlet and mechanical mixer
Clarifier Type:	Dortmund – confirm off design report
Number of Clarifiers:	2
Total Area of all Clarifiers:	800 m^2
Total Capacity of Clarifiers:	36 Mℓ/d
Filter Type:	Rapid Gravity Sand Filters
Number of Filters:	6
Filter Floor Type:	Monolithic
Total Filtration Area of all Filters:	169 m^2
Total Filtration Design Capacity of all Filters:	30 Mℓ/day
Total Capacity of Backwash Water Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Capacity of Used Wash Water System:	
Primary Post Disinfection Type:	Chlorine Gas
Disinfection Dosing Capacity:	2.5 kg/hr (max)
Disinfectant Storage Capacity:	Stored in 70 kg Cylinders
Total Treated Water Storage Capacity:	10.0 Mℓ

Table 11.39 Pipeline Details: uMtamvuna Supply System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity* (Mℓ/day)	Age (years)
uMtamvuna	Rising Main	River Abstraction	Off-Channel Storage Dam	3.8	600	Steel	30.0	11
uMtamvuna	Gravity Main	OCS Dam	uMtamvuna WTP	1.0	700	Steel	27.5	19
uMtamvuna	Gravity Main	uMtamvuna WTP	BP 1	12.4	400	Steel	21.7	35
uMtamvuna	Rising Main	uMtamvuna WTP	Florida Reservoir	3.0	250 400	PVC uPVC	6.4 16.2	11 1

* Capacity based on a velocity of 2 m/s gravity and 1.5 m/s pumped

Table 11.40 Pump Details: uMtamvuna Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
uMtamvuna	Abstraction Works LLP	2	2	KSB KRT/K250-400 (3 off) ABS XFP 250M (1 off)	Abstraction Works	Raw Water Tank (500 kℓ concrete reservoir)	30.0	33.3	16.0
uMtamvuna	Abstraction Works HLP	2	2	KSB WLKn 200-5	Raw Water Tank	uMtamvuna WTP OCS dam		280.0	12.0
uMtamvuna	Hanover	2	1	Q-Gem150DL200-20*4	Clear Water Reservoir	Florida Reservoir		65.0	6.2

Table 11.41 Reservoir Details: uMtamvuna Supply System.

System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
uMtamvuna	uMtamvuna Dam	OCS Dam	180	Balancing	532.0	Unknown
uMtamvuna	uMtamvuna WTP	Clear Water (5 Mℓ 2 off)	10.0	Balancing	515.0	511.0
uMtamvuna	Nzimakwe	BP 1	0.1	Distribution	247.0	Unknown
uMtamvuna	Nzimakwe	BP 2	5.0	Balancing	174.0.	166.5
uMtamvuna	Florida	Florida	0.25	Distribution	539.6	Unknown

(d) Harding-Weza Supply System (Operated by Umgeni Water)

This scheme comprises of two supply systems which are linked via an emergency potable water pipeline from the Ikwezi Reservoir (Weza Supply System) to the clear water tanks at the Harding WTP. Both systems are owned by Ugu DM. Both WTP's are operated by Umgeni Water under a management contract which took effect during August 2019. Due to various issues on both sites Umgeni Water started fully operating and maintaining the WTP's from January 2020. Potable water is sold "at the fence" thereafter, Ugu DM are responsible for the distribution. The Weza Supply System supplies the rural areas of kwaMachi, kwaJili and kwaMthimude which are all west of the town of Harding. The Harding Supply System supplies the town of Harding and an emergency link to assure the water supply to the rural areas of kwaFodo and KwaMbotho located east of the town and N2 provincial route.

Raw water is pumped from the Amanzimnyama Dam (**Figure 11.35**) to the Harding WTP situated in close proximity to a command reservoir. Potable water is gravity fed from the WTP to the command reservoir and is then reticulated to the town. An emergency link connection to kwaFodo and kwaMbotho supply areas is provided via a booster pump station adjacent to the N2.

A run-of-river abstraction, in the adjacent Weza River Catchment, pumps raw water to the Weza WTP. Potable water is pumped from this WTP to Ikwezi Command Reservoirs and the kwaJali Reservoir, then distributed through an extensive gravity-fed (kwaMachi) and pumped (kwaJali) network to the various communities in the area. The emergency link to Harding is gravity-fed.

Details of the water treatment plant (**Table 11.42 and Table 11.43**), pipelines (**Table 11.44**), pump stations (**Table 11.45**) and reservoirs (**Table 11.46**) are provided below.

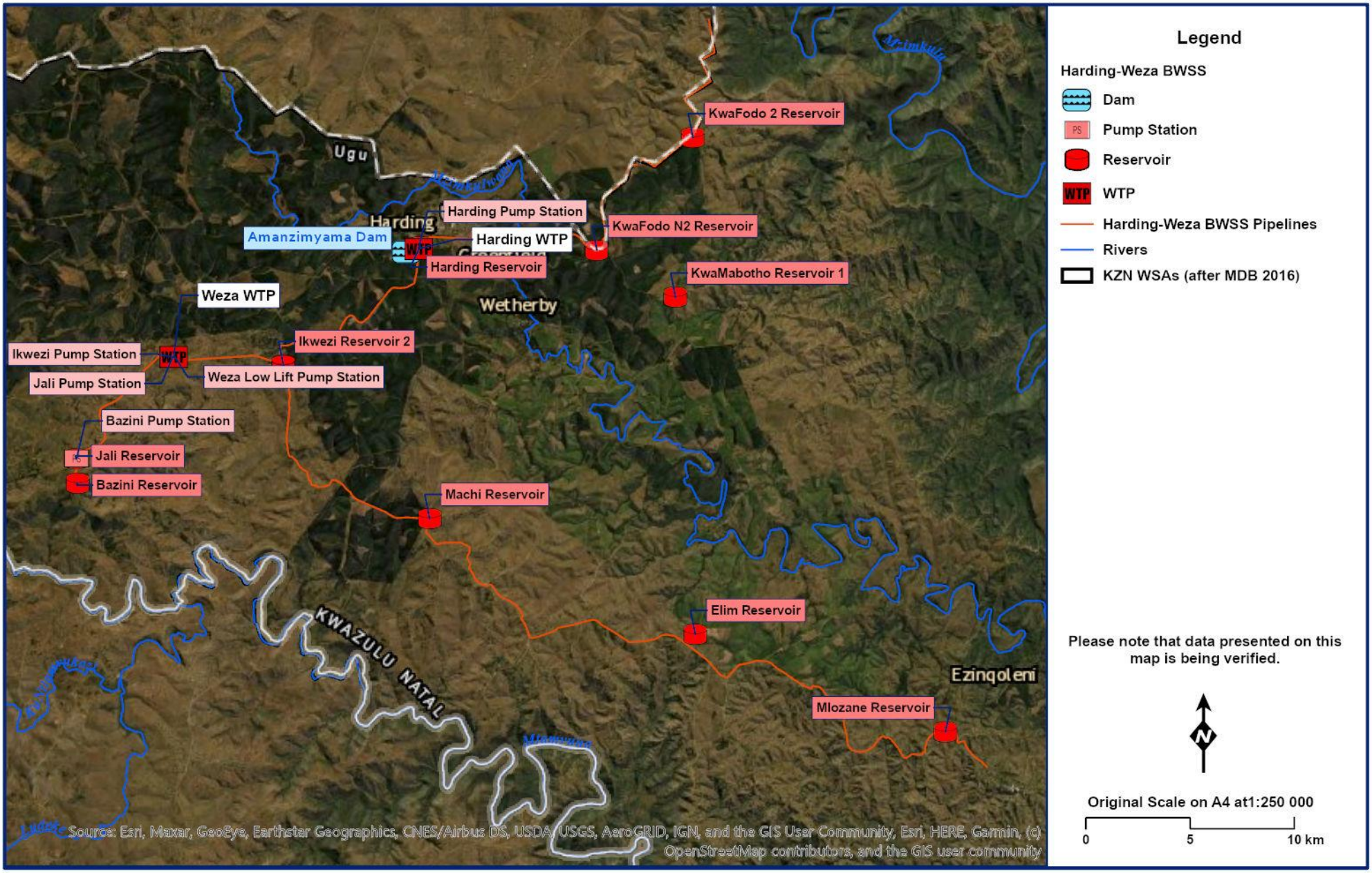


Figure 11.35 Harding-Weza Supply System.

Table 11.42 Characteristics of Harding WTP.

WTP Name:	Harding WTP
System:	Harding Supply System
Maximum Design Capacity:	1.2 Mℓ/day
Current Utilisation:	0.4 Mℓ/day
Raw Water Storage Capacity:	
Raw Water Supply Capacity:	2 Mℓ/day
Pre-Oxidation Type:	Pre chlorination (Sodium hypo)
Primary Water Pre-Treatment Chemical:	Polyelectrolyte (Rheofloc 5023Xl)
Total Coagulant Dosing Capacity:	
Rapid Mixing Method:	Baffled mixing channel
Clarifier Type:	Horizontal Flow
Number of Clarifiers:	8 (4 US)
Total Area of all Clarifiers:	480 m^2
Total Capacity of Clarifiers:	1.4 Mℓ/day
Filter Type:	Pressure Filters
Number of Filters:	6
Filter Floor Type:	N/A
Total Filtration Area of all Filters:	7.80 m^2
Total Filtration Design Capacity of all Filters:	1.4 Mℓ/day
Total Capacity of Backwash Water Tanks:	Nil
Total Capacity of Sludge Treatment Plant:	Nil
Capacity of Used Wash Water System:	Nil
Primary Post Disinfection Type:	Sodium Hypochlorite
Disinfection Dosing Capacity:	6 ℓ/hr
Disinfectant Storage Capacity:	
Total Treated Water Storage Capacity:	1.8 Mℓ

Table 11.43 Characteristics of Weza WTP.

WTP Name:	Weza WTP (old/new & package)
System:	Weza Supply System
Maximum Design Capacity:	5.2 (3.2 & 2) Mℓ/day
Current Utilisation:	3.5 Mℓ/d
Raw Water Storage Capacity:	2 Mℓ/day
Raw Water Supply Capacity:	4.7 Mℓ/day
Pre-Oxidation Type:	Pre chlorination
Primary Water Pre-Treatment Chemical:	Polyelectrolyte (Rhefloc5023X)
Total Coagulant Dosing Capacity:	7.6 ℓ/hr
Rapid Mixing Method:	Static mixer & inlet pipes
Clarifier Type:	? & Lamella
Number of Clarifiers:	11A (6+4 & 1)
Total Area of all Clarifiers:	70 m^2
Total Capacity of Clarifiers:	5.0 (3.0 & 2.0) Mℓ/d
Filter Type:	Rapid Gravity & Pressure Filters
Number of Filters:	6 (2+2 & 2)
Filter Floor Type:	N/A
Total Filtration Area of all Filters:	17 m^2 (13.2 & 3.6)
Total Filtration Design Capacity of all Filters:	2.9 (2.3 & 0.6) Mℓ/day
Total Capacity of Backwash Water Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Capacity of Used Wash Water System:	
Primary Post Disinfection Type:	Sodium Hypochlorite
Disinfection Dosing Capacity:	6 ℓ/hr
Disinfectant Storage Capacity:	?
Total Treated Water Storage Capacity:	0.3 Mℓ

Table 11.44 Pipeline Details: Harding-Weza Supply System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity* (Mℓ/day)	Age (years)
Harding	Gravity main	Amanzimnyama Dam	Raw Water Pump station	0.3 0.3	160 250	PVC Steel	4.7	30
Harding	Rising main	Raw Water Pump Station	Harding WTP	0.4	200	Steel	4.1	30
Harding	Gravity & Main	Harding WTP Reservoir	kwaFodo Reservoir (incl. N2 Booster Pump station)	7.1 & 1.9	200 & 160	PVC	1.0	17
Weza	Gravity Main	Ikwezi Command Reservoirs	Harding WTP	3.5 & 5.8	250 & 200	PVC	1.5	17
Weza	Rising Main	Weza River	Weza WTP	0.1			4.0	17
Weza	Rising Main	Weza WTP	Ikwezi Reservoir	5.4	200 350	Steel/PVC Steel/PVC	3.4	17
Weza	Rising Main	Weza WTP	kwaJali Reservoir	7.0	150	Steel/FC	0.8	17

* Capacity based on a velocity of 2 m/s and 1.5 m/s pumped.

Table 11.45 Pump Details: Harding-Weza Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
Harding	Dam low lift pump station	2	1	KSB ETA 080-065-250	Amanzimnyama Dam	Raw Water Tank	60.0	85	2.6
Harding	N2 Booster Pump station	2	1		Harding Clear Water Tank (500 kℓ concrete reservoir)	kwaFodo Reservoir (100 kℓ concrete reservoir)t WTP	99.0	130	2.0
Weza	River low lift pump station	1	1		Weza River	Weza WTP Raw Water Tank (500 kℓ SBS reservoir)			
Weza	kwaJali Pump station	2	1	Salmson Multi V1814-FGE-T4/2	Weza WTP Clear Water Tank (500 kℓ SBS reservoir)	kwaJali Reservoir	162.5	210	0.5
Weza	Ikwezi Pump Station	2	1	Howden Multi W/65/5 KSB Wkln 65/6	Weza WTP Clear Water Tank (150 kℓ SBS reservoir)	2 x 150kℓ Command Reservoir	186.5	250	3.3

Table 11.46 Reservoir Details: Harding-Weza Supply System.

System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
Harding	Clear Water tanks (3 off) at Harding WTP	Harding WTP Reservoirs	2.2	Balancing	923.0	735.5
Harding	Harding Emergency Supply Scheme	Harding Reservoir	1.0	Distribution	901.1	Unknown
Harding	Harding Emergency Supply Scheme	kwaFodo N2 Reservoir	0.1	Balancing	1000.0	864.3
Weza	Clear Water tanks (2 off) at Harding WTP	Weza WTP Reservoirs	0.3	Balancing	875.0	Unknown
Weza	kwaJali	kwaJali Reservoir	0.5	Balancing / Distribution	1037.5	Unknown
Weza	Ikwezi Local	Ikwezi Reservoir	1.0	Distribution	1011A.0	Unknown
Weza	Ikwezi Command (2 off)	Command Reservoir	1.0	Balancing	1061.35	908.3 905.1

(e) Vulamehlo Supply System (Operated by Ugu DM)

Commonly known as the Vulamehlo Cross Border Scheme, as the supply system is intended to serve both the Ugu DM and Harry Gwala DM. The Vulamehlo Supply System supplies the inland rural areas of the Jolivet, Hlokozi, Nyavini and Braemar. The bulk water works was designed, constructed and commissioned by Umgeni Water in 2001. After commissioning the WTP was handed over to Ugu DM as the appointed WSA. Ugu DM own and operate the entire supply system.

Raw water is pumped from a weir situated in the Upper uMtwalume River (**Figure 11.36**) to the Vulamehlo WTP. Water is abstracted via 4 well points positioned on the upstream side of the weir. Potable water is pumped from the WTP for reticulation to the various communities in the area. Following the revised demarcation of District Municipal Boundaries, some of the areas supplied by the Vulamehlo WTP (Hluthankungu, Jolivet) now fall within the Harry Gwala District Municipality. This scheme will, therefore, be regarded as a "regional scheme" with more than one WSA being supplied from the same source.

Details of the water treatment plant (**Table 11.47**), pipelines (**Table 11.48**), pump stations (**Table 11.49Table** 11.49) and reservoirs (**Table 11.50Table 11.50**) are provided below.

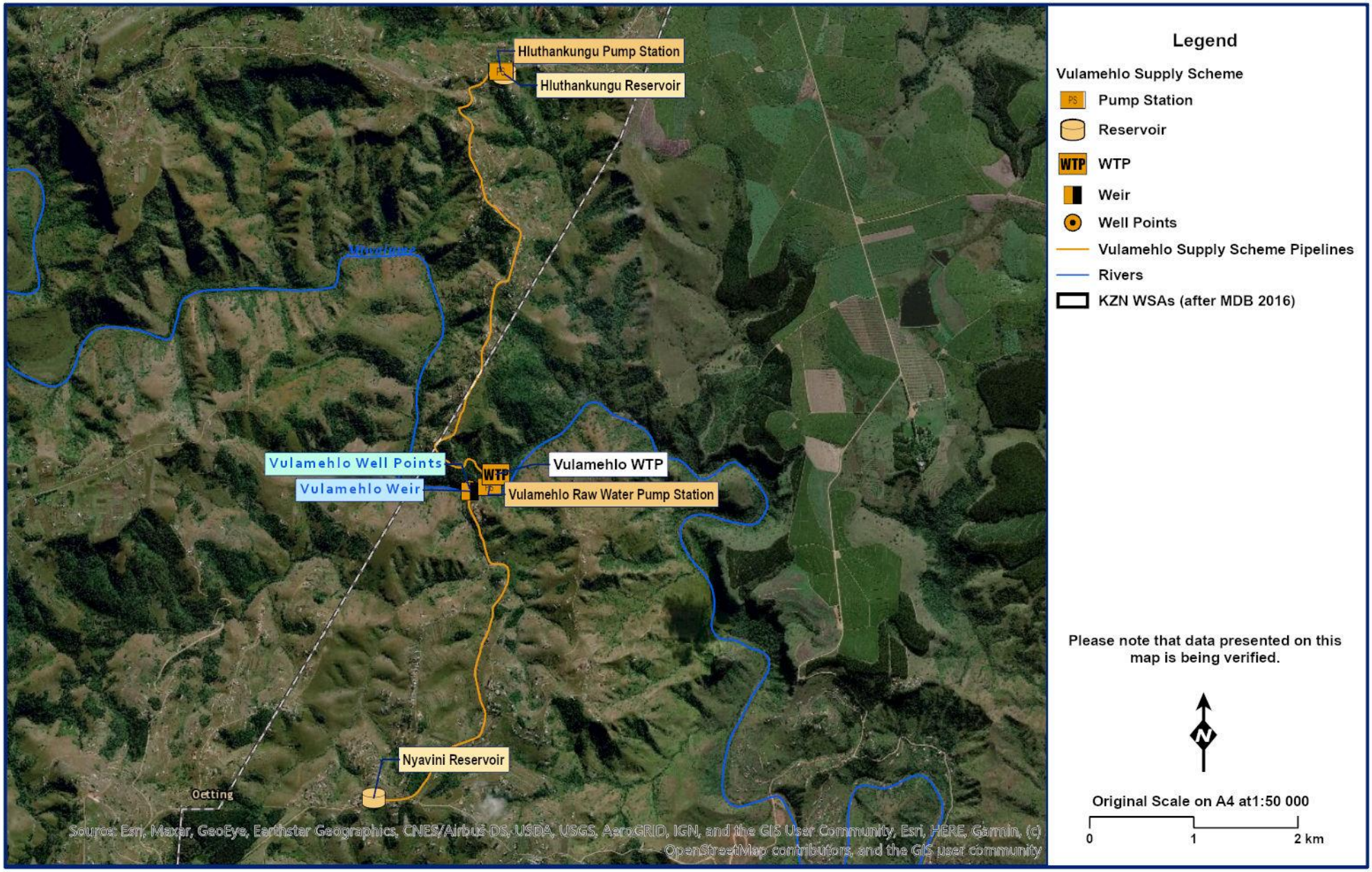


Figure 11.36 Vulamehlo Supply System.

Table 11.47 Characteristics of Vulamehlo WTP.

WTP Name:	Vulamehlo WTP
System:	Vulamehlo Supply System
Maximum Design Capacity:	2.5 Mℓ/day
Current Utilisation:	2.8 Mℓ/d
Raw Water Storage Capacity:	0.4 Mℓ/day
Raw Water Supply Capacity:	2.6 Mℓ/day
Pre-Oxidation Type:	Pre chlorination
Primary Water Pre-Treatment Chemical:	Aluminium Sulphate
Total Coagulant Dosing Capacity:	Unknown
Rapid Mixing Method:	Unknown
Clarifier Type:	Unknown
Number of Clarifiers:	2
Total Area of all Clarifiers:	Unknown
Total Capacity of Clarifiers:	Unknown
Filter Type:	Pressure Filters
Number of Filters:	4
Filter Floor Type:	N/A
Total Filtration Area of all Filters:	Unknown
Total Filtration Design Capacity of all Filters:	3 Mℓ/day
Total Capacity of Backwash Water Tanks:	N/A
Total Capacity of Sludge Treatment Plant:	N/A
Capacity of Used Wash Water System:	
Primary Post Disinfection Type:	Sodium Hypochlorite
Disinfection Dosing Capacity:	Unknown
Disinfectant Storage Capacity:	Unknown
Total Treated Water Storage Capacity:	0. 75 Mℓ

Table 11.48 Pipeline Details: Vulamehlo Supply System.

System	Pipeline Name	From	To	Length (km)	Nominal Diameter (mm)	Material	Capacity* (Mℓ/day)	Age (years)
Vulamehlo	Gravity / Rising Main	River Abstraction	Vulamehlo WTP	0.168 / 0.107	200	Steel / AC	2.5	20
Vulamehlo	Rising Main	Vulamehlo WTP	Nyavini Reservoir 1	3.1	150	Steel	1.5	20
Vulamehlo	Rising Main	Vulamehlo WTP	Hluthankungu Reservoir A	4.0	200	Steel	2.5	20

* Capacity based on a velocity of 2 m/s for gravity and 1.5 m/s for pumped.

Table 11.49 Pump Details: Vulamehlo Supply System.

Supply System	Pump Station Name	Number of Pumps		Pump Description	Supply From	Supply To	Static Head (m)	Duty Head (m)	Duty Capacity (Mℓ/day)
		Number of Duty Pumps	Number of Standby Pumps						
Vulamehlo	Raw Water Pump Station	1	1	Flyt	Well Points	Raw Water Tank (200 kℓ)	16.0	26.0	2.6
Vulamehlo	Clean water pump station	1	1	Unknown	Clear Water Tanks	Nyavini Reservoir	232.0	255.0	0.5
Vulamehlo	Clean water pump station	1	1	WKLn 40/7	Clear Water Tanks	Hluthankungu Reservoir	248.0	272.0	2.0

Table 11.50 Reservoir Details: Vulamehlo Supply System.

System	Reservoir Site	Reservoir Name	Capacity (Mℓ)	Function	TWL (mASL)	FL (mASL)
Vulamehlo	Raw Water Pump Station/uMtwalume	Raw Water Tank	0.4	Balancing	613.0	608.5
Vulamehlo	WTP Potable Water Pump Station	Clear Water Tank	0. 75	Distribution	602.0	597.0
Vulamehlo		Nyavini Reservoir	0.5	Balancing	828.0	Unknown
Vulamehlo		Hluthankungu Reservoir A	2.0	Balancing	838.7	Unknown

11.4 Status Quo and Limitations

The existing water supply infrastructure within the South Coast Systems is described above. The intention of this section is to align the latest water demand projections with the water availability from the water resources identified above, such that any shortfalls in the water balance may be identified. Infrastructure plans to address any shortfalls are presented under recommendations.

11.4.1 Raw Water Supply (Water Availability)

With reference to **Section 11.2**, the South Coast System hydrology shows highly varied flow with a wide range between winter and summer flows, specifically on rivers with no storage (uMkhomazi and Mtwalume).

The water availability, at 1:50 year (98%) assurance of supply, per sub-region is summarised in **Table 11.51** along with the current water treatment capacity and production statistics for the Upper and Middle South Coast Systems. Analyses of the historical production at the various WTP's are illustrated graphically and presented in the ensuing sections below.

Table 11.51 Water Availability: Upper and Middle South Coast System.

Sub Region	Supply System	Resource Infrastructure	1:50 Yield (Mℓ/day)	Treatment Capacity (Mℓ/day)	Historical 2020 Treatment (Mℓ/day)	Above Optimal Operating Capacity (%)	Above Design Capacity (%)
Upper	Amanzimtoti	Nungwane Dam	9.9	22.0	15.0	19	5
Middle	Craigieburn*	Goodenough Weir Run-of-river	5.0	4.2*	n/a	n/a	n/a
Middle	Umzinto	Umzinto and EJ Smith Dams	8.9	13.6	10.2	40	2
Middle	Mtwalume	Run-of-river Abstraction	7.5	7.5(9.5)	12.4	99(99)**	99(96)**
Lower	Mhlabatshane	Mhlabatshane Dam	4.1	4.0	5.5	83	61

* Decommissioned; supplied from Amanzimtoti System

** This indicates that the WTP is operating at full capacity all the time, which is not sound operating practice as it leaves very little opportunity for scheduled maintenance on the filters and auxiliary equipment

The water availability, at 1:50 year (98%) assurance of supply, per sub-region, is summarised in **Table 11.52** along with the current water treatment capacity and production statistics for the Lower South Coast System. Analyses of the historical production at the various WTP's are illustrated graphically and presented in the ensuing sections below.

Table 11.52 Water Availability: Lower South Coast System.

Sub Region	Supply System	Resource Infrastructure	1:50 Yield (Mℓ/day)	Treatment Capacity (Mℓ/day)	Historical 2020 Treatment (Mℓ/day)
Lower	uMzimkhulu	Run-of-River Abstraction	50.1	81	45.7
Lower	uMtamvuna	Run-of-River Abstraction	33.0	20(30)	18.4
Lower	Harding-Weza	Amanzimnyama Dam and Run-of-River Abstraction	5.2	6.4*	5.2**
Lower	Vulamehlo	Run-of-river Abstraction	1.6	3.0	2.8

* Includes Emergency Link to be Decommissioned kwaFodo and kwaMbotho WTP, supplied from Harding-Weza System

** This indicates that the WTP is operating at full capacity all the time, which is not sound operating practice as it leaves very little opportunity for scheduled maintenance on the filters and auxiliary equipment

The data available to perform the typical water treatment statistical analyses, for the Lower South Coast System, over the past year was highly variable and reliable water consumption trends for the various WTP's could not be ascertained. As a result, no meaningful statistical analysis per WTP is reported. Instead, the last 10 years of annual sales volumes have been compared against the respective WTP capacity and illustrated in **Table 11.52** (data source from: DWS2011A, UAP2016 and Joat2021).

It is important to note that the analyses considers annual average demand. It is likely that all WTP's would have experienced shortages of water within the systems due to peak week daily demands exceeding the rated treatment capacities and/or water resource yields.

11.4.2 Amanzimtoti Supply System

An analysis of historical production at the Amanzimtoti WTP (November 2019 to October 2020) is presented in **Figure 11.37.** The raw water inflow at Amanzimtoti WTP was an average of 15.0 Mℓ/day. The plant operated within the design capacity 94.8% of the time and operated within the optimal operating capacity 81.1% of the time. The "total sales" volume from Amanzimtoti WTP includes both the potable water produced at the plant and the inflow to the plant clear water reservoirs from the Wiggins WTP via the SCA Pipeline.

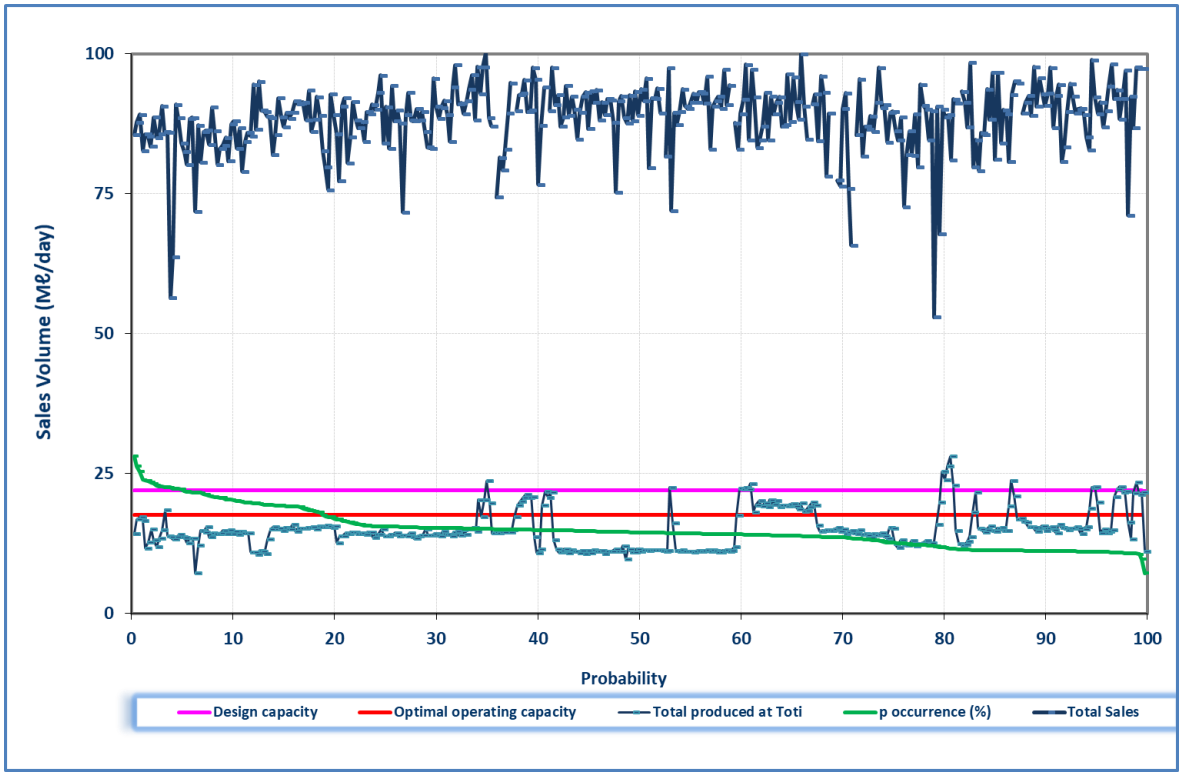


Figure 11.37 Analysis of historical production at Amanzimtoti WTP (November 2019 to October 2020).

The treatment facility at Craigieburn WTP has been decommissioned and supply to this demand node is now off the SCP-1. eThekwini Municipality has installed an off-take on the SCP-1 downstream of Quarry Reservoir (Singh's Off-Take Link) to supply the Craigieburn area. Consequently, the raw water pump station at Craigieburn WTP has been decommissioned. The Craigieburn WTP potable water pump station was mothballed in October 2019 after eThekwini Municipality commissioned the upgrade to the Singh's Pump Station.

11.4.3 Umzinto Supply System

An analysis of daily historical production of the Umzinto WTP (November 2019 to October 2020) is presented in **Figure 11.38** and shows that the inflow at Umzinto WTP exceeded both the 1:50 year assurance of supply volume and the optimal operating capacity (i.e. 80% of design capacity) of the WTP for only 40% of the time. The design capacity was exceeded 2% of the time and this is considered acceptable for this plant. The "total sales" volume from the Umzinto WTP includes both the potable water produced at the plant and the inflow to the plant from the Ellingham Link Pipeline.

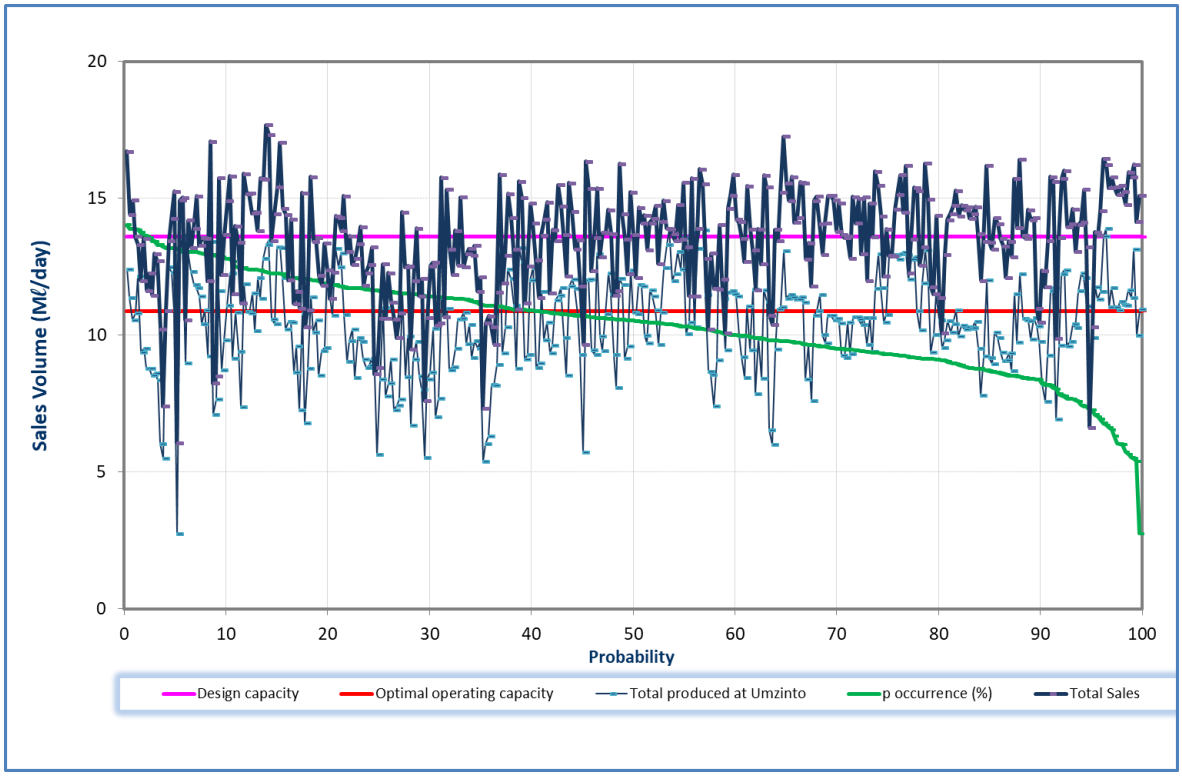


Figure 11.38 Analysis of historical production at Umzinto WTP (November 2019 to October 2020).

11.4.4 Mtwalume Supply System

An analysis of the daily historical production of the Mtwalume WTP (November 2019 to October 2020), against the upgraded capacity is presented in **Figure 11.39**. It shows that for 99% of the time the WTP was operated above the optimal operating capacity (80% of design capacity) and for 99% of the time the WTP was operated at above design capacity. This indicates that the WTP is operating at full capacity all of the time, which is not sound operating practice as it leaves inadequate opportunity for scheduled maintenance on the filters and auxiliary equipment. In this regard, Umgeni Water installed a 2 Mℓ/day water treatment package plant at the site. Unfortunately, the growth in water demand has utilised this "spare" capacity, resulting in the WTP still operating 99% of the time above the optimal operating capacity and 96% of the time above the design capacity.

Raw water supply to Mtwalume WTP is via run-of-river abstraction. This supply is ultimately constrained by the availability of stream flow, especially during drought periods.

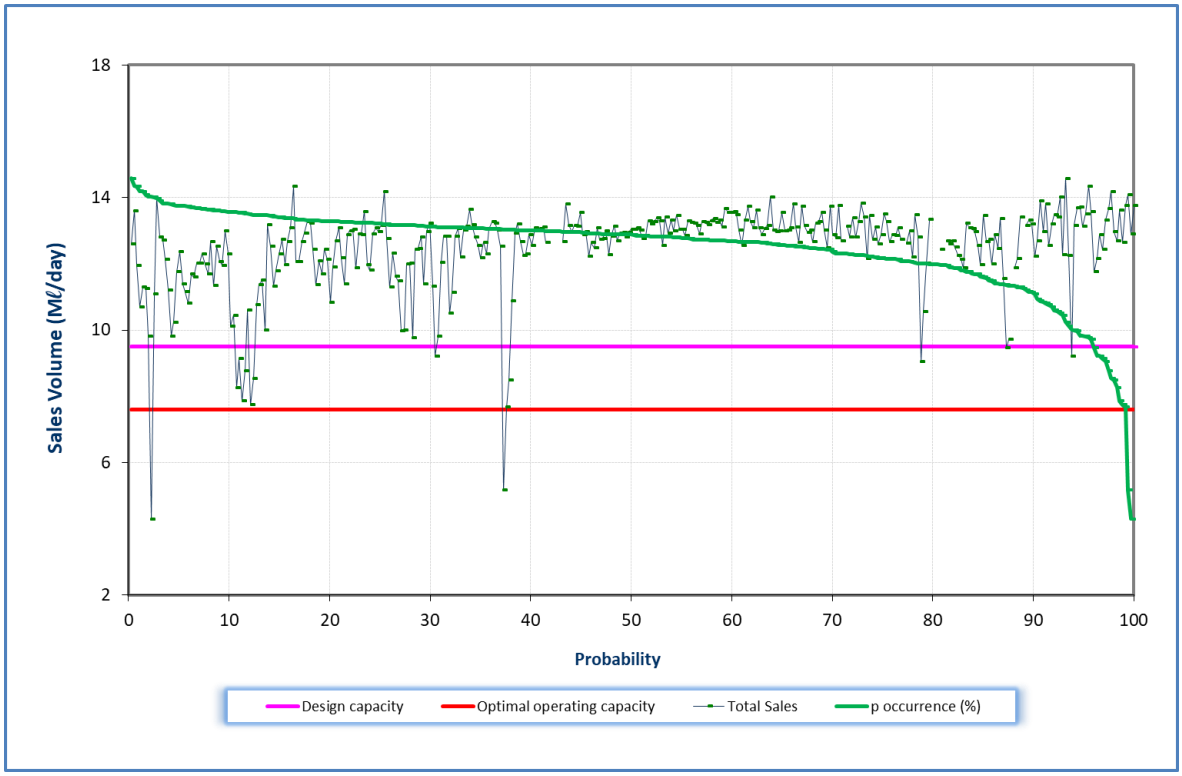


Figure 11.39 Analysis of historical production at Mtwalume WTP (November 2019 to October 2020).

11.4.5 Mhlabatshane Supply System

An analysis of historical production at the Mhlabatshane WTP (November 2019 to October 2020) is presented in **Figure 11.40.** The raw water inflow at Mhlabatshane WTP exceeded the 1:50 year assurance of supply volume. The demand from the WTP was constrained by the availability of raw water from the Mhlabatshane Dam over the past year. The optimal operating capacity of the WTP was thus only exceeded 83% of the time and design capacity was exceeded 61% during this period.

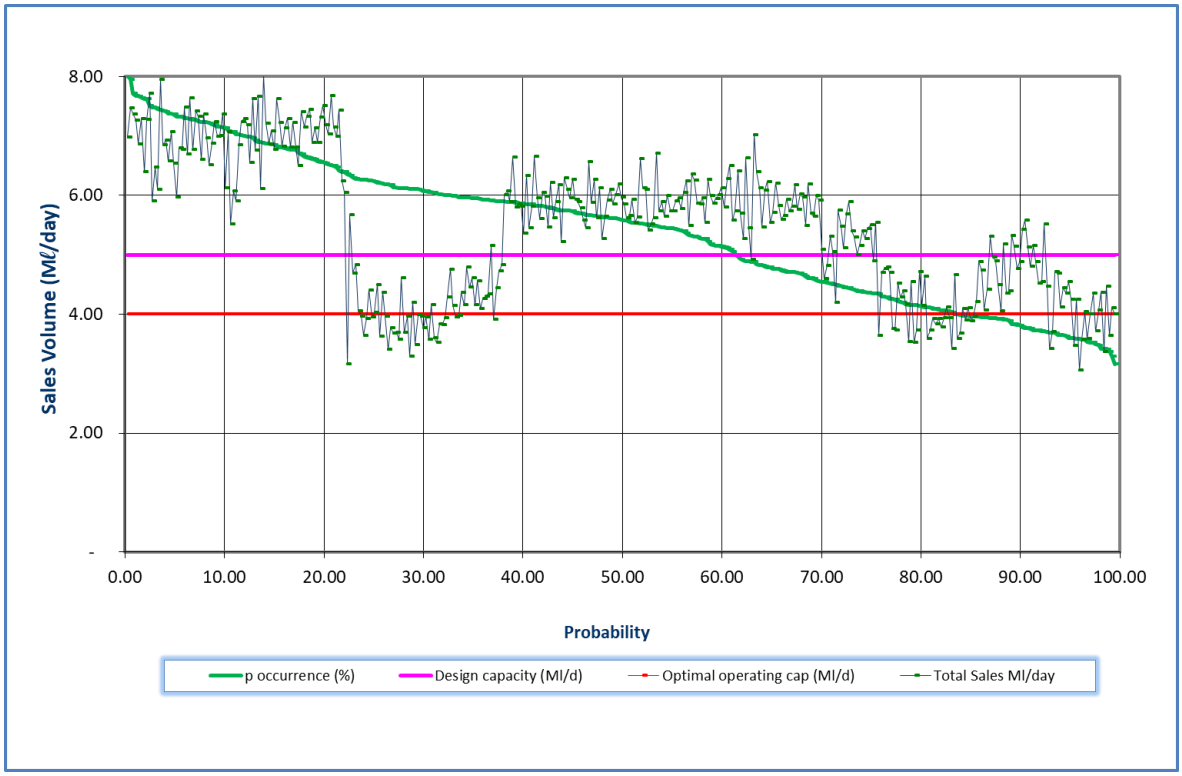


Figure 11.40 Analysis of historical production at Mhlabatshane WTP (November 2019 to October 2020).

11.4.6 uMzimkhulu Supply System

An analysis of annual historical production at the Bhobhoyi WTP (January 2011 to June 2020) is presented in **Figure 11.41.** The raw water inflow at Bhobhoyi WTP exceeded the 1:50 year assurance of supply volume. As a result, there has not been a marked uptake in demand since the commissioning of the WTP upgrade. The optimal operating capacity of the WTP has not been exceeded since the upgrade.

Raw water supply to Bhobhoyi WTP is via run-of-river abstraction. This supply is ultimately constrained by the availability of stream flow, especially during drier periods where saline water from the estuary pushes upstream towards the abstraction works for the WTP.

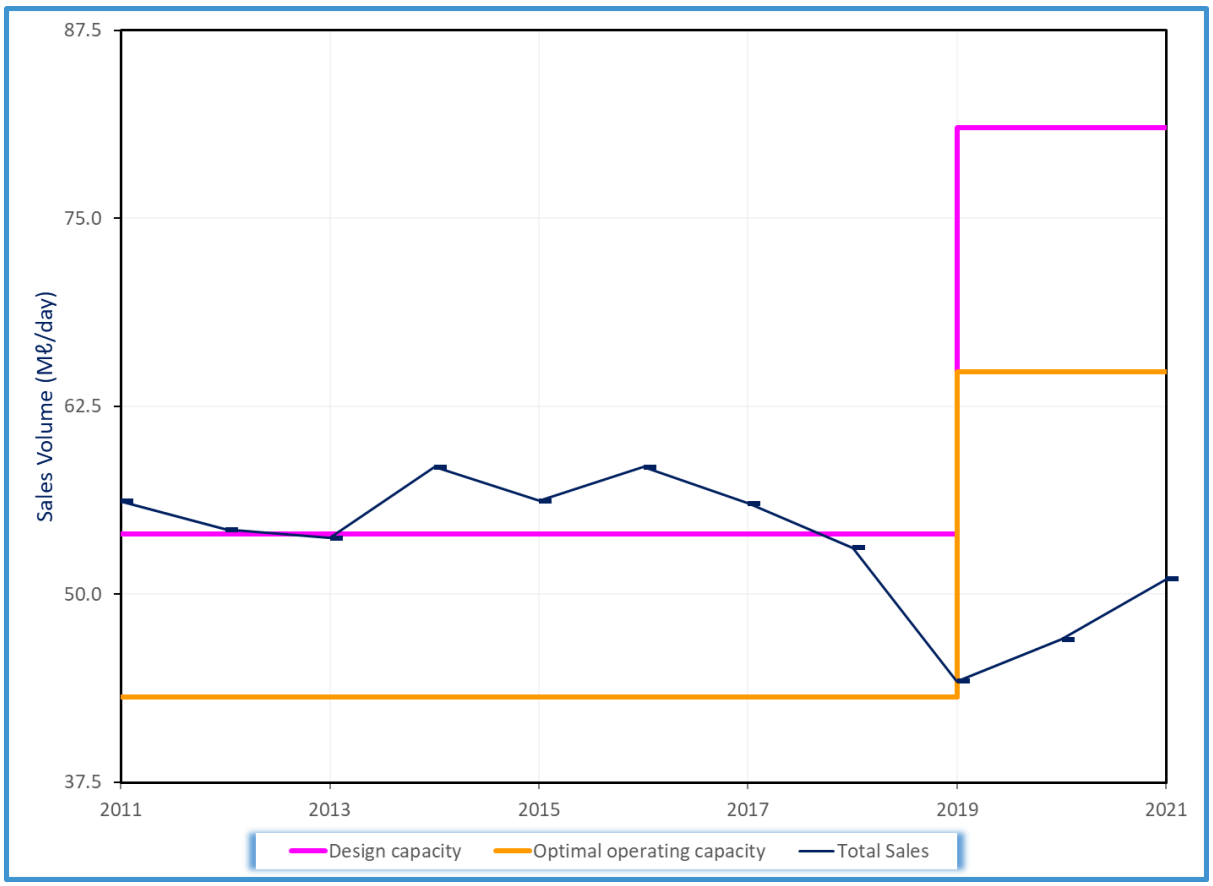


Figure 11.41 Analysis of historical production at Bhobhoyi WTP (January 2011 to June 2020).

In 2012 DWS reported that the volume of water being abstracted at St Helen's Rock had exceeded the lowest flows in the dry months resulting in salt water from the estuary being pumped into the WTP from St Helen's Rock. This was as a result of the run-of-river water resource being fully utilised and this highlights the need for the augmentation of the system via a DWS proposed OCS dam at Ncwabeni.

There is an opportunity to optimise the existing water resources by linking the potable infrastructure from the uMtamvuna System with that of the uMzimkhulu System thereby shedding some potable water demand off the Bhobhoyi WTP.

11.4.7 uMtamvuna Supply System

An analysis of annual historical production of the uMtamvuna WTP (January 2011 to June 2020) is presented in **Figure 11.42** and shows that the inflow at uMtamvuna WTP was less than the 1:50 year assurance of supply volume. However, this demand does exceed the optimal operating capacity (i.e. 80% of design capacity) of the WTP. It appears that the WTP was operated at above design capacity from 2013 to 2019 for 100% of the time. This is not considered sound operating practice as it leaves inadequate opportunity for scheduled maintenance on the filters and auxiliary equipment.

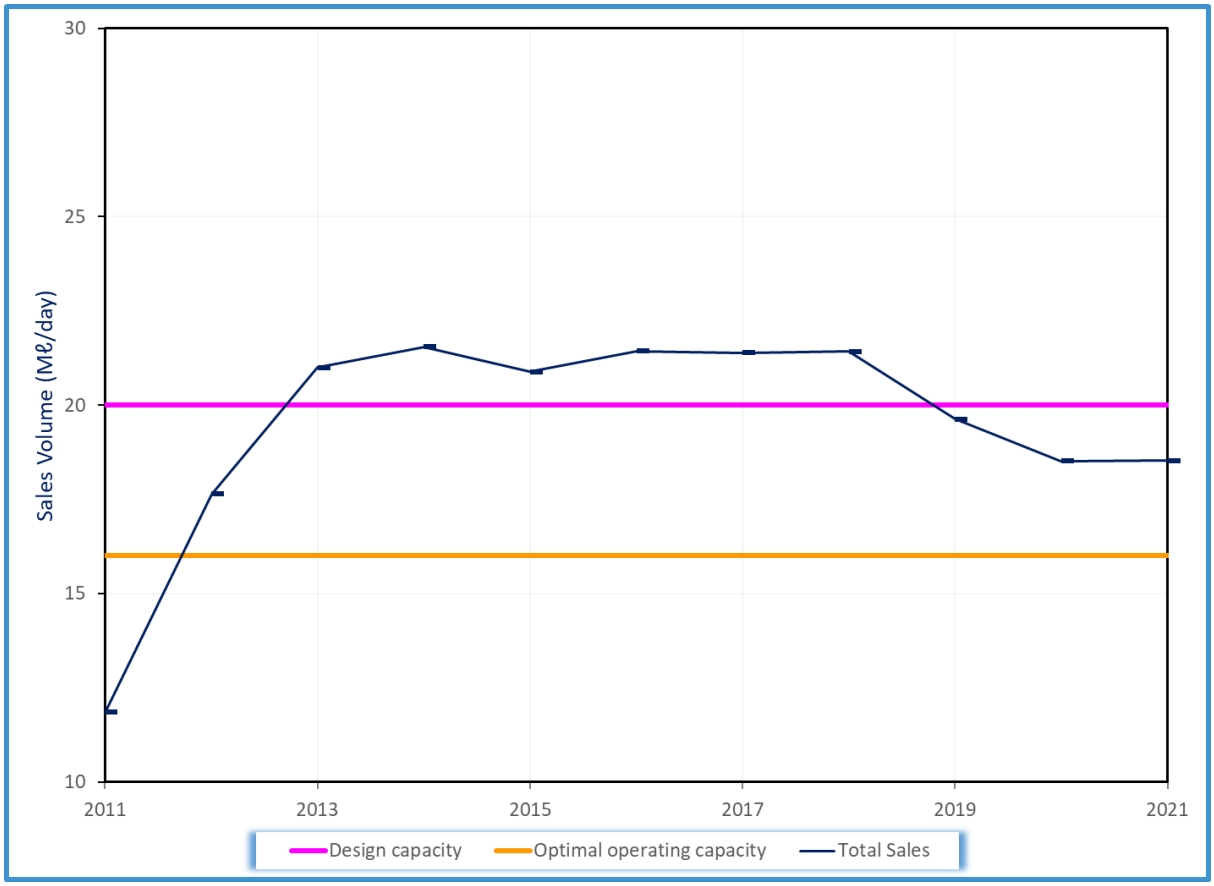


Figure 11.42 **Analysis of historical production at uMtamvuna WTP (January 2011 to June 2020).**

11.4.8 Harding-Weza Supply System

This system should be viewed holistically due to the interdependency and augmentation between the sub-systems. Any inadequacy of one section of the infrastructure is likely to place strain on upstream sections. **Section 11.3.3(d)** and **Section 11.5.7** (see **Figure 11.53**) describes how the system is configured and operated. It is important to note that Harding WTP raw water supply is constrained by the lack of yield from the Amanzimnyama (Harding) Dam; whereas Weza WTP run-of-river raw water supply is greater than the plant's treatment capacity. Hence the need for an augmentation scheme to support Harding.

An analysis of the annual historical production of the Harding and Weza WTP's (January 2011 to June 2020) is presented in **Figure 11.43**. It shows that neither the design capacity nor the optimal operating capacity was exceeded over the past year. The "total sales" volume from the Weza WTP includes both the potable water produced at the plant and the inflow to the Harding WTP clear water reservoirs.

Raw water supply to Weza WTP is via run-of-river abstraction. This supply is ultimately constrained by the availability of stream flow, especially during drier periods. Over the past year Amanzimnyama (Harding) Dam has fluctuated around the dead storage level.

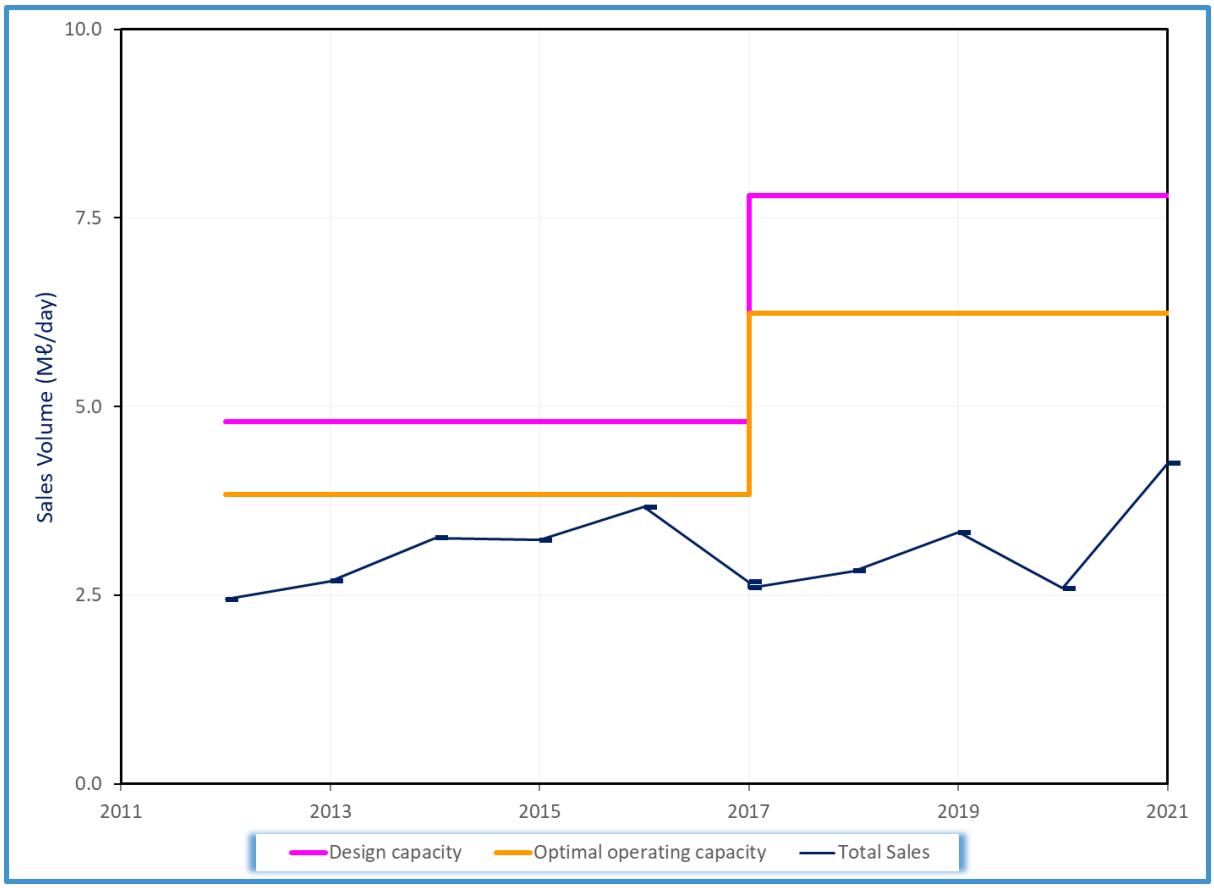


Figure 11.43 Analysis of historical production at Harding-Weza WTP's (January 2011 to June 2020).

11.4.9 Vulamehlo Supply System

An analysis of annual production at the Vulamehlo WTP (January 2011 to June 2020) is presented in **Figure 11.44**. The raw water inflow at Vulamehlo WTP exceeded the 1:50 year assurance of supply volume. There has not been a marked uptake in demand since the commissioning of the WTP upgrade. The extent of expansion to new water supply zones, by Ugu DM, as well as the associated quantum of water loss is unknown. The optimal operating capacity of the WTP has not been exceeded since the upgrade.

Raw water supply to Vulamehlo WTP is via run-of-river abstraction. This supply is ultimately constrained by the availability of stream flow, especially during drier periods.

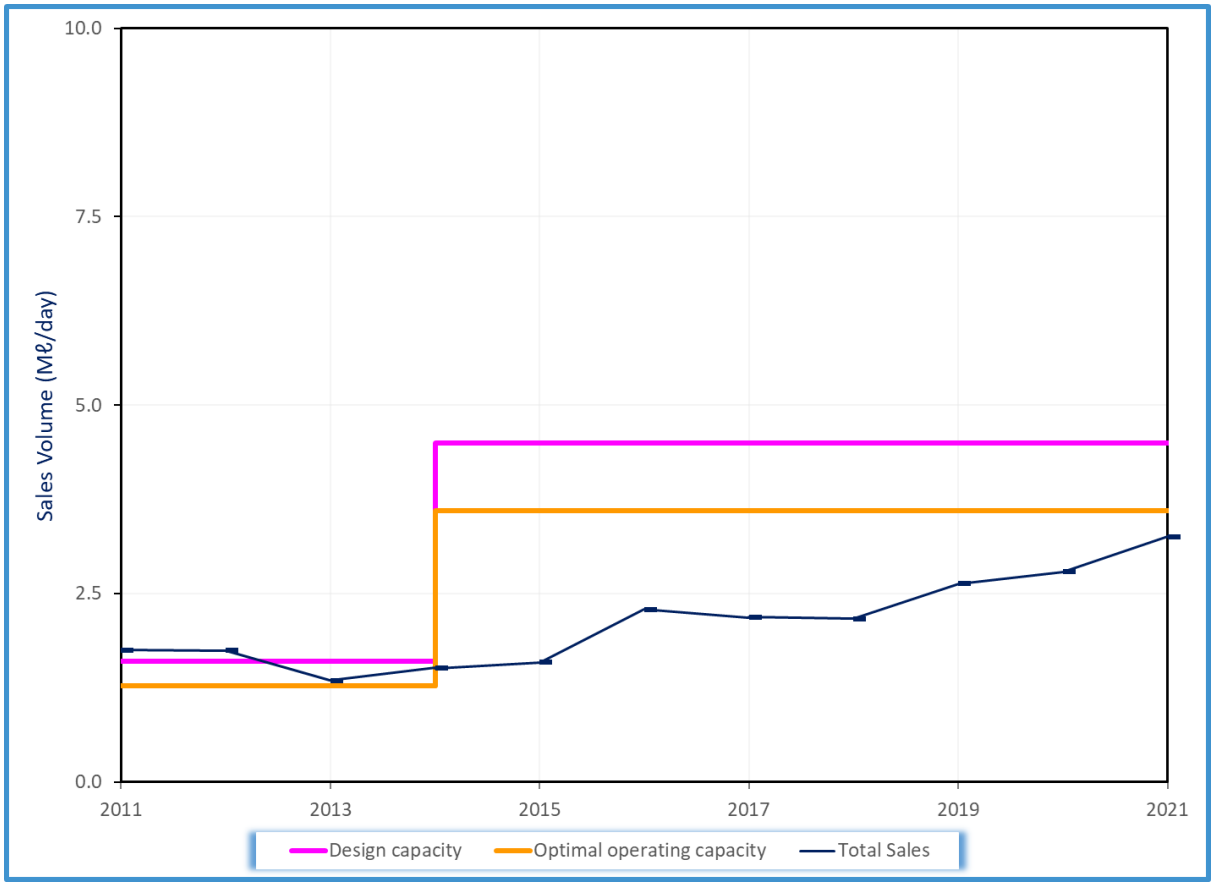


Figure 11.44 Analysis of historical production at Vulamehlo WTP (January 2011 to June 2020).

11.4.10 Summary

Conclusions relating to raw water supply (water availability) in the South Coast System are:

- The Upper and Middle Sub-Systems show a failure in the hydrological water balance; i.e. potential shortfall of raw water supply to the WTPs.
- Raw water supply to the Amanzimtoti and Umzinto WTP has to be augmented to enable the full treatment capacity to be utilised.
- Raw water supply to the Mtwalume and Mhlabatshane WTP has to be augmented to enable the full treatment capacity to be utilised reliably.
- The Mtwalume and Mhlabatshane WTP are currently being operated beyond their design capacity.
- The Lower Sub-Systems show a failure in the hydrological water balance; i.e. shortfall of raw water supply to the WTPs (specifically the uMzimkhulu, Weza and uMtwalume Rivers).
- Raw water supply to the Bhobhoyi, Harding-Weza and Vulamehlo WTP should be augmented to enable the full treatment capacity to be utilised.
- The uMtamvuna and Vulamehlo WTP's are currently being operated beyond their design capacity.

With reference to **Section 11.2** there is sufficient raw water available in the rivers within the water resource impoundments and rivers of the South Coast System. There are, however, opportunities for

additional yield from these rivers through the development of new water resource infrastructure. Typically, these resources are too far from the users. The Mpambanyoni Emergency Scheme provides temporary relief by utilising the run-of-river flows when available, thereby improving the yield of the Umzinto System. The scheme is not permanent and the additional increase in yield is unreliable.

The proposed Weza River Emergency Scheme should provide temporary relief by utilising the run-of-river flows when available, thereby improving the yield of the Harding-Weza System. The scheme is not permanent and the additional increase in yield is unreliable.

11.5 Water Usage and Demand Estimates

Figure 11.45; Figure 11.46; Figure 11.47; Figure 11.48; Figure 11.49; and **Figure 11.50** illustrate, schematically, the Upper and Middle South Coast System in its current configuration and the existing demands being placed on the network. These schematics should be referred to when reading this Section.

Figure 11.51; Figure 11.52; Figure 11.53; and **Figure 11.54** illustrate, schematically, the Lower South Coast System in its current configuration. These schematics should be referred to when reading this Section.

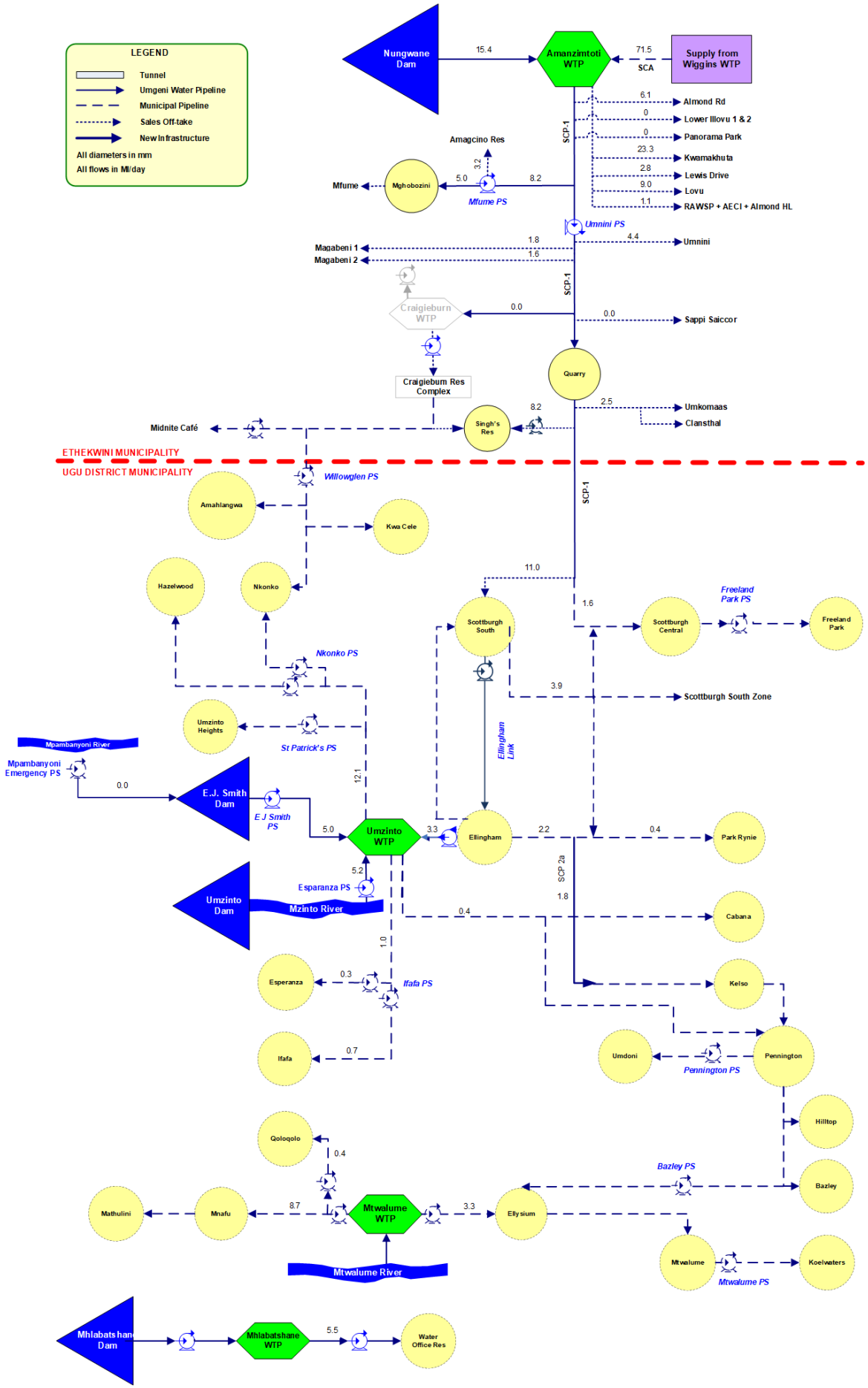


Figure 11.45 Demand on the South Coast System as at October 2020.

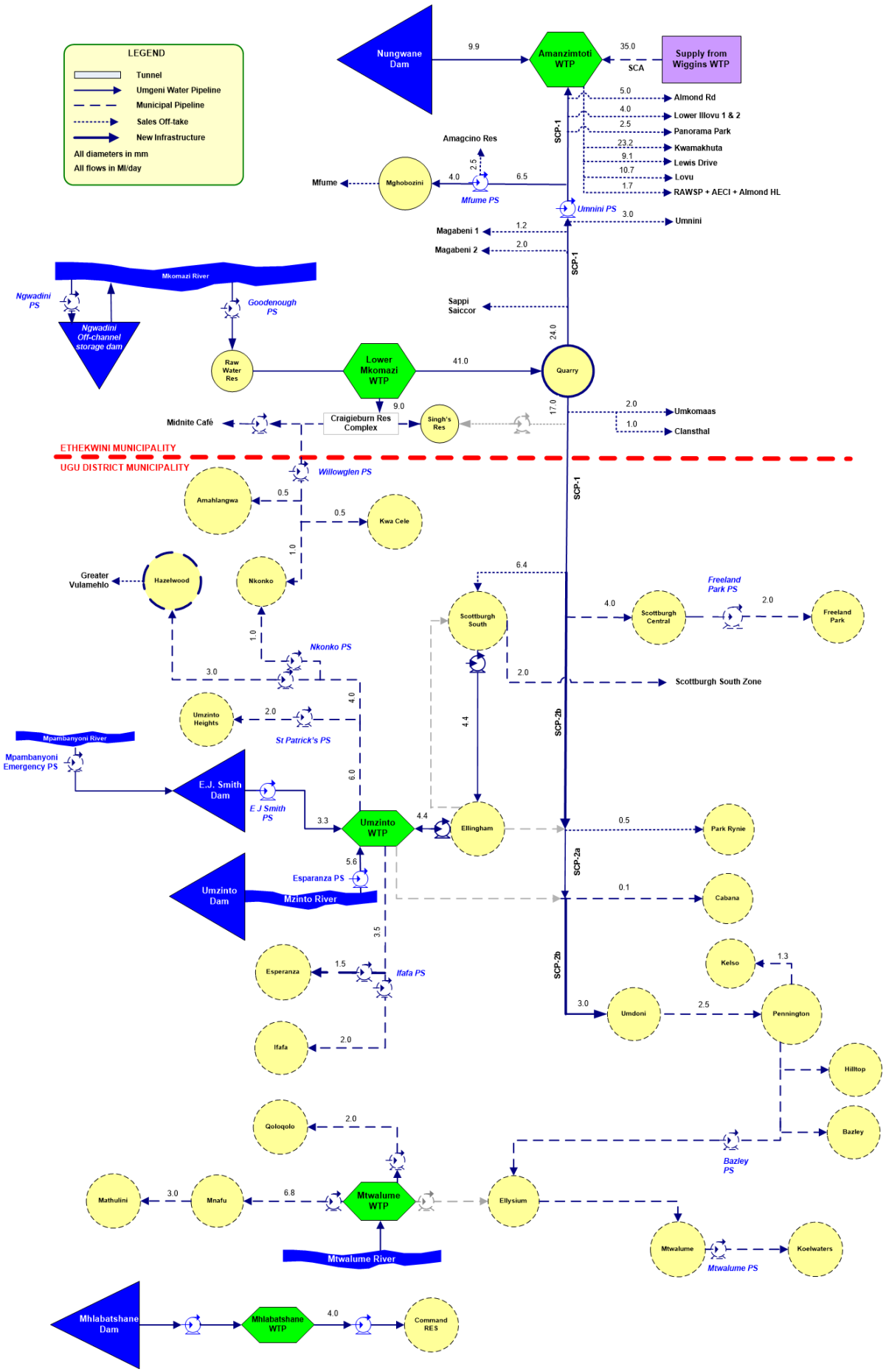


Figure 11.46 Five year demand projection for the South Coast System.

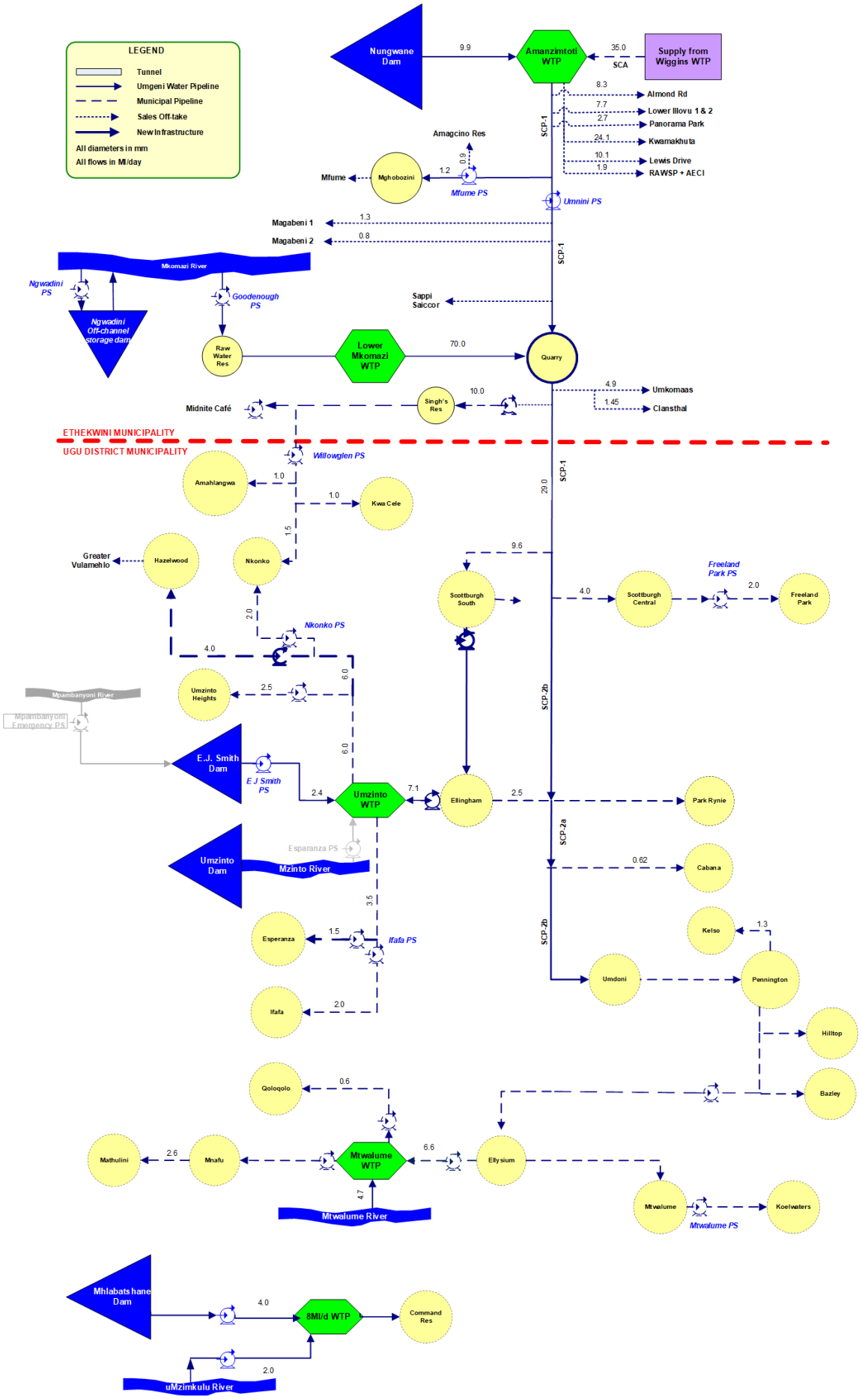


Figure 11.47 Ten year demand and projection for the South Coast System.

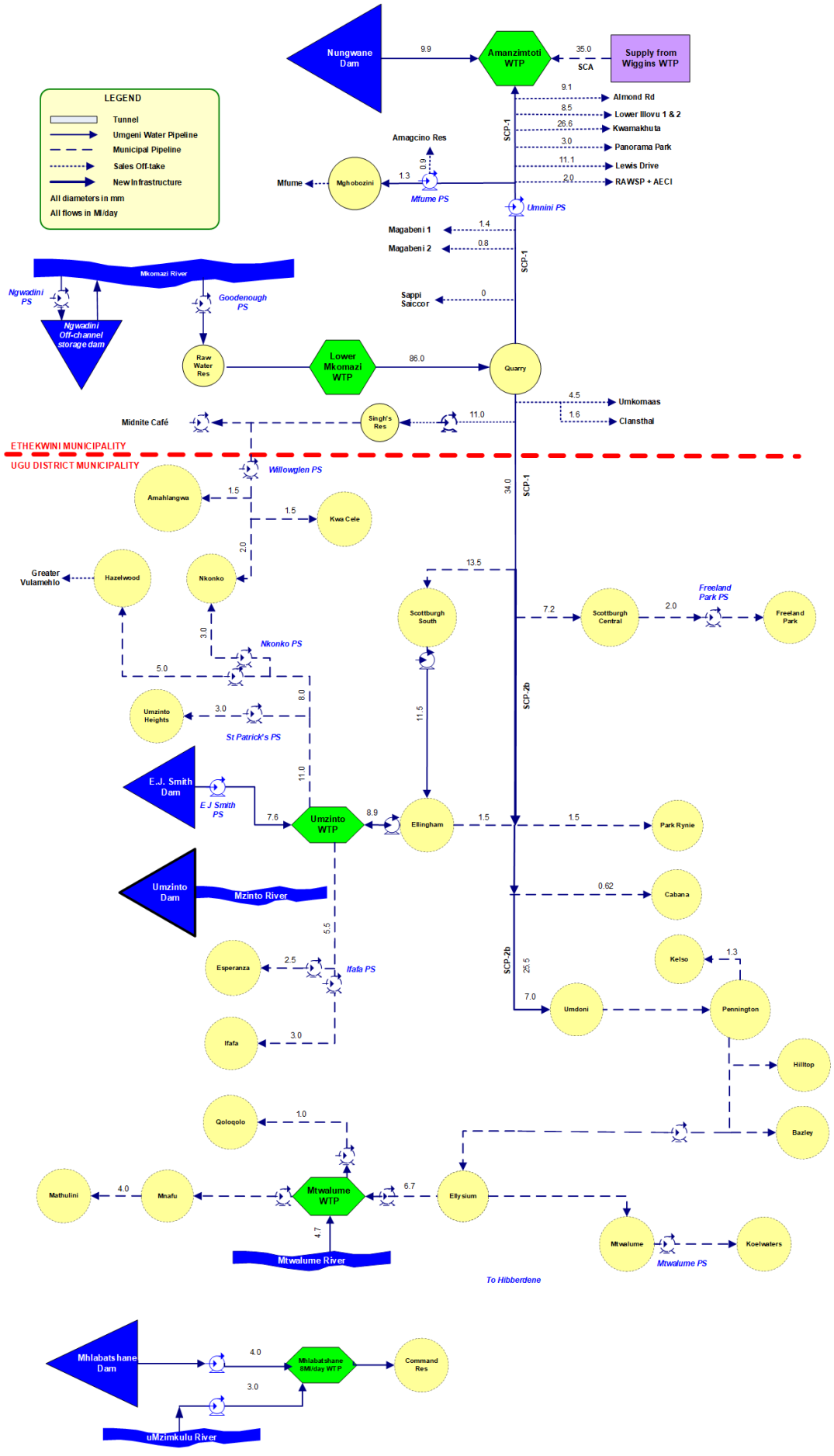


Figure 11.48 Fifteen year demand projection for the South Coast System.

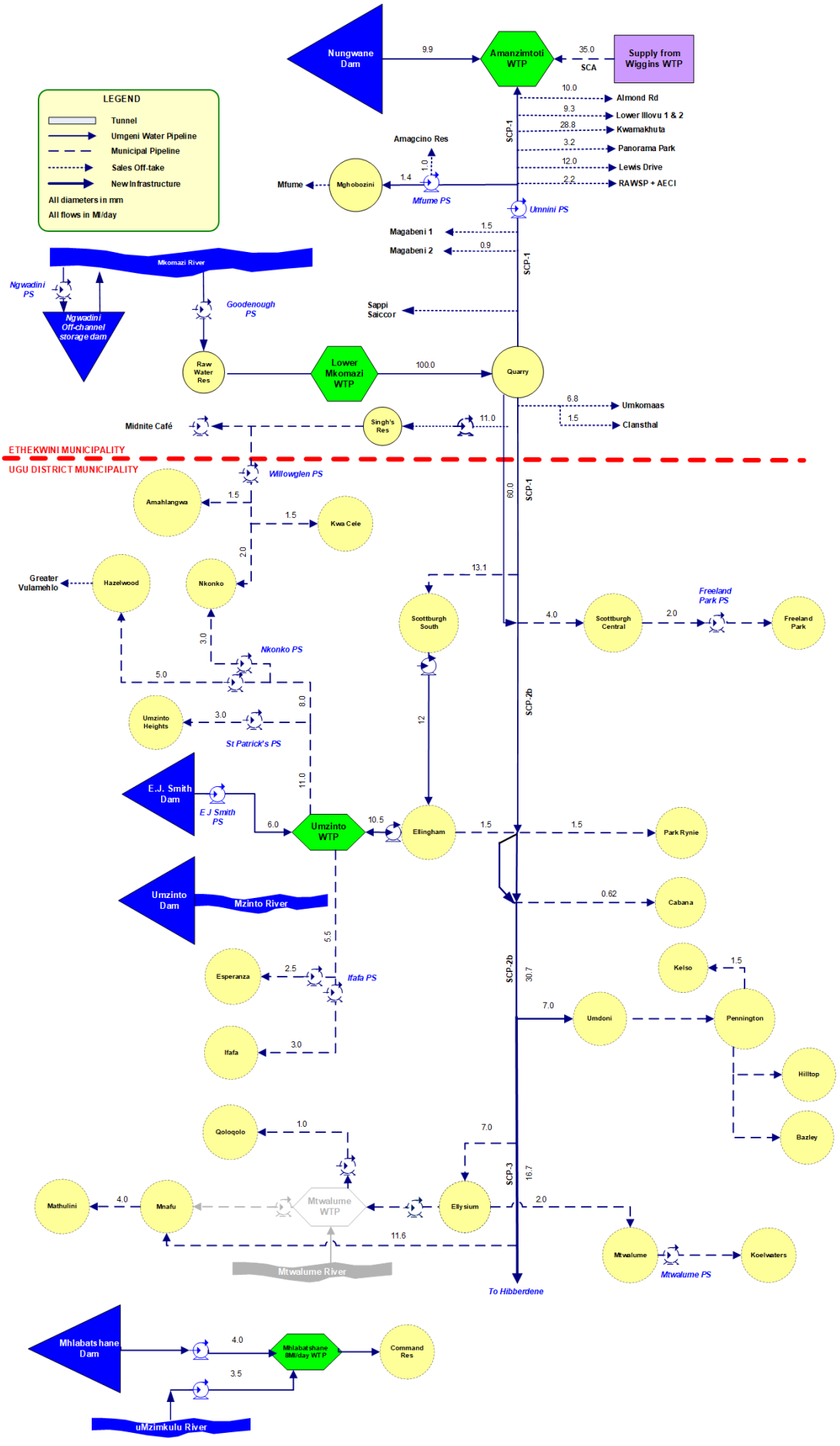


Figure 11.49 Twenty year demand and projection for the South Coast System.

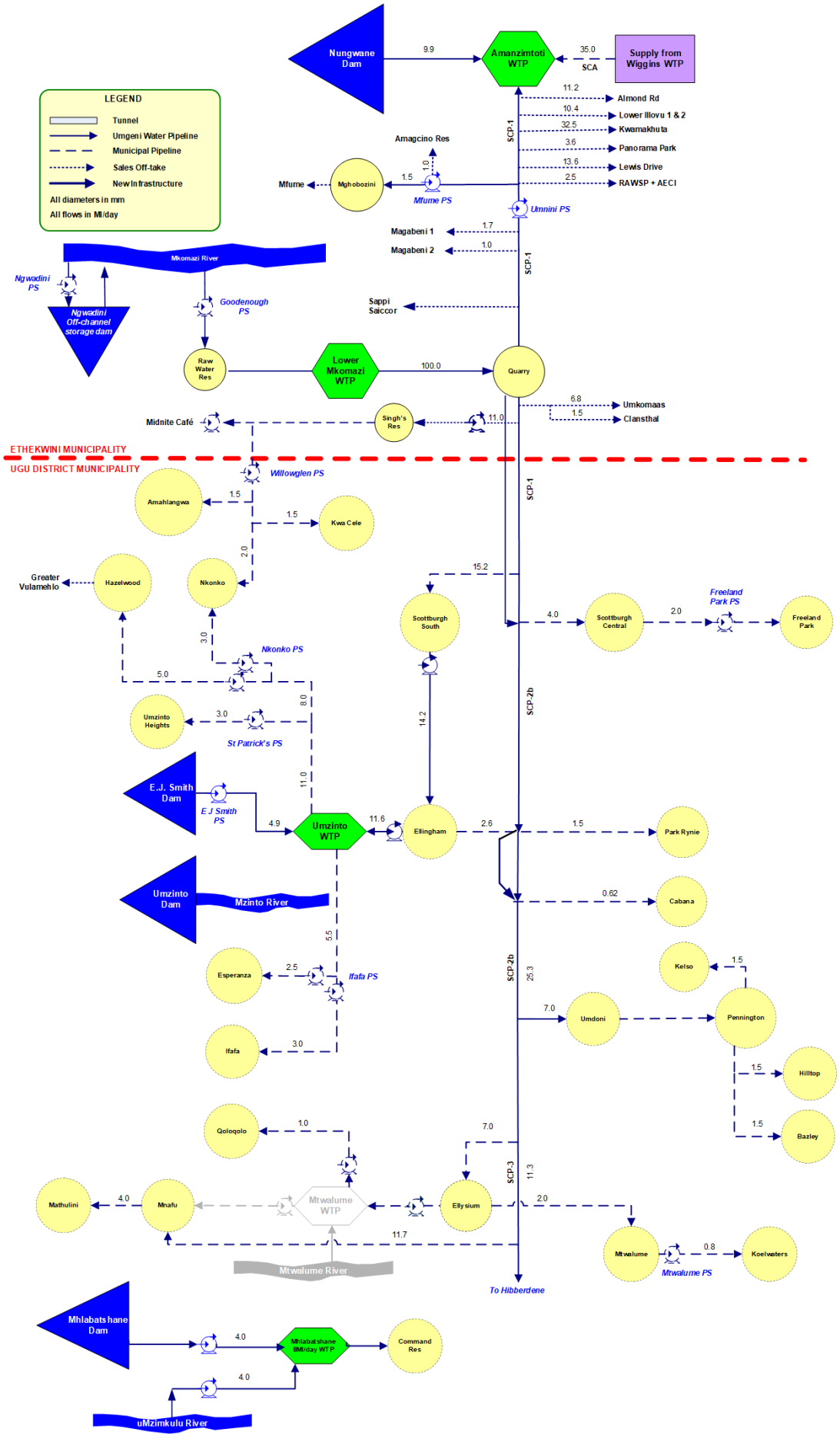


Figure 11.50 Thirty year demand projection for the South Coast System.

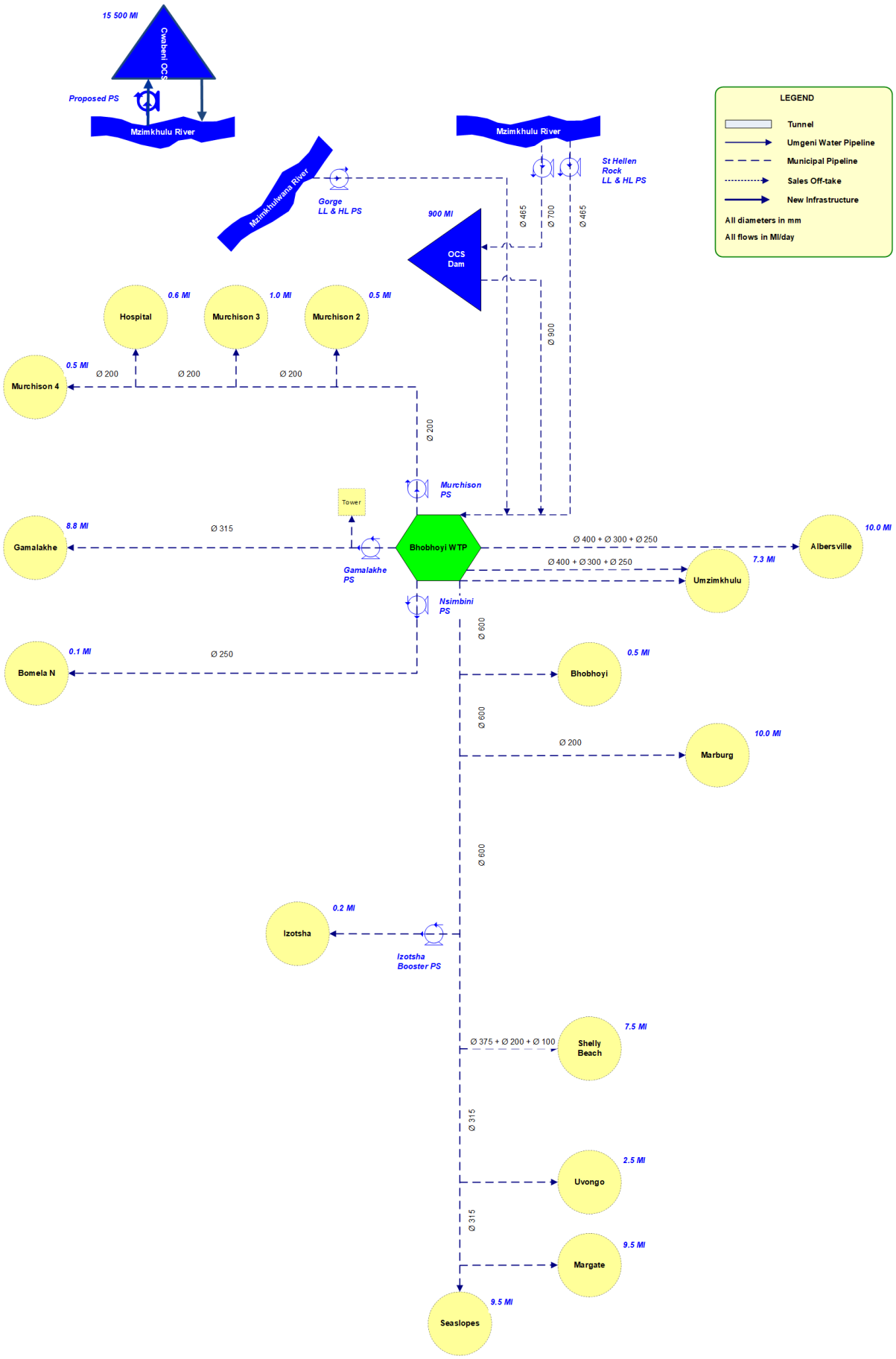


Figure 11.51 Schematic of the uMzimkhulu System Bulk Supply Infrastructure.

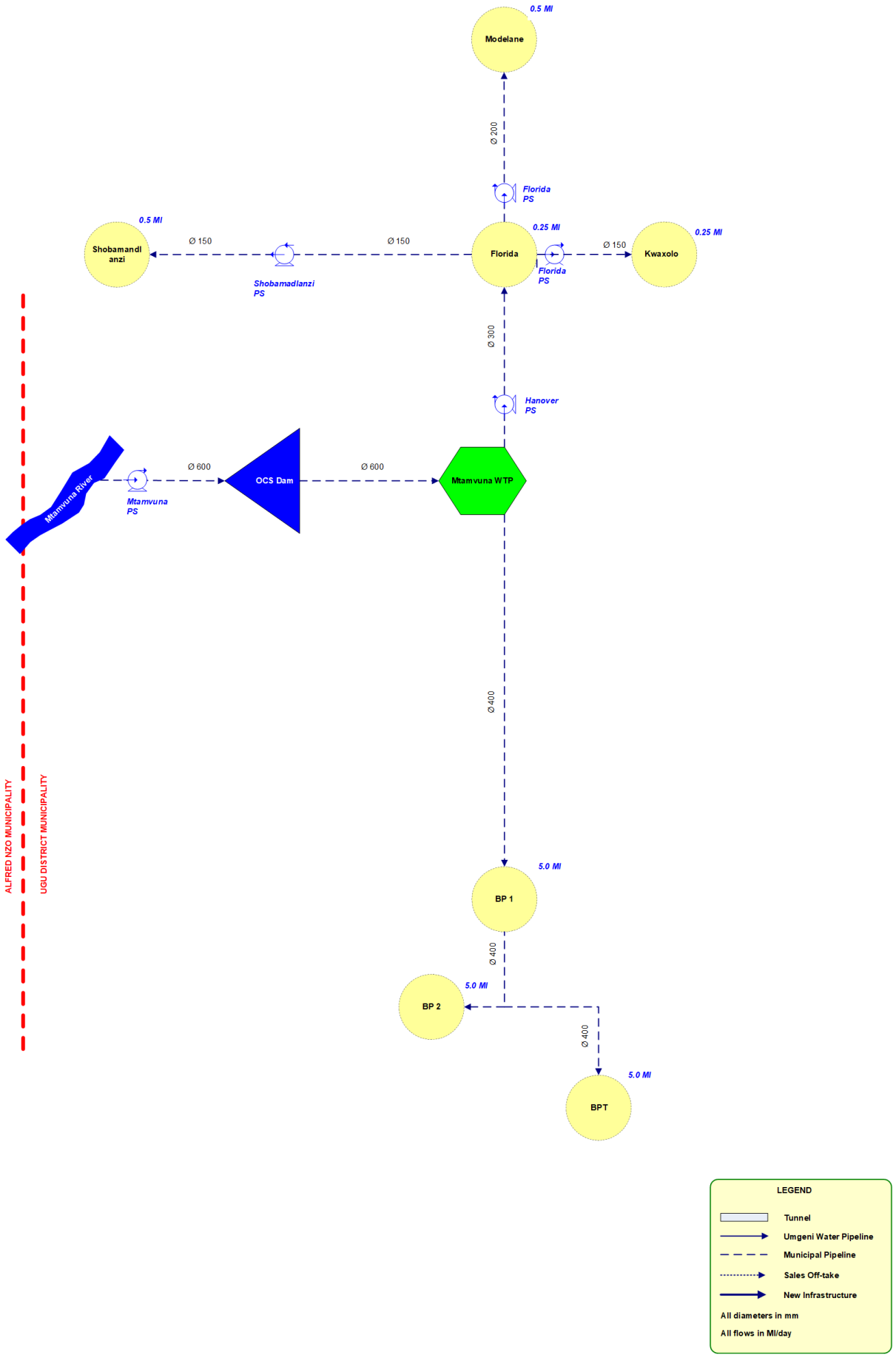


Figure 11.52 Schematic of the uMtamvuna System Bulk Supply Infrastructure.

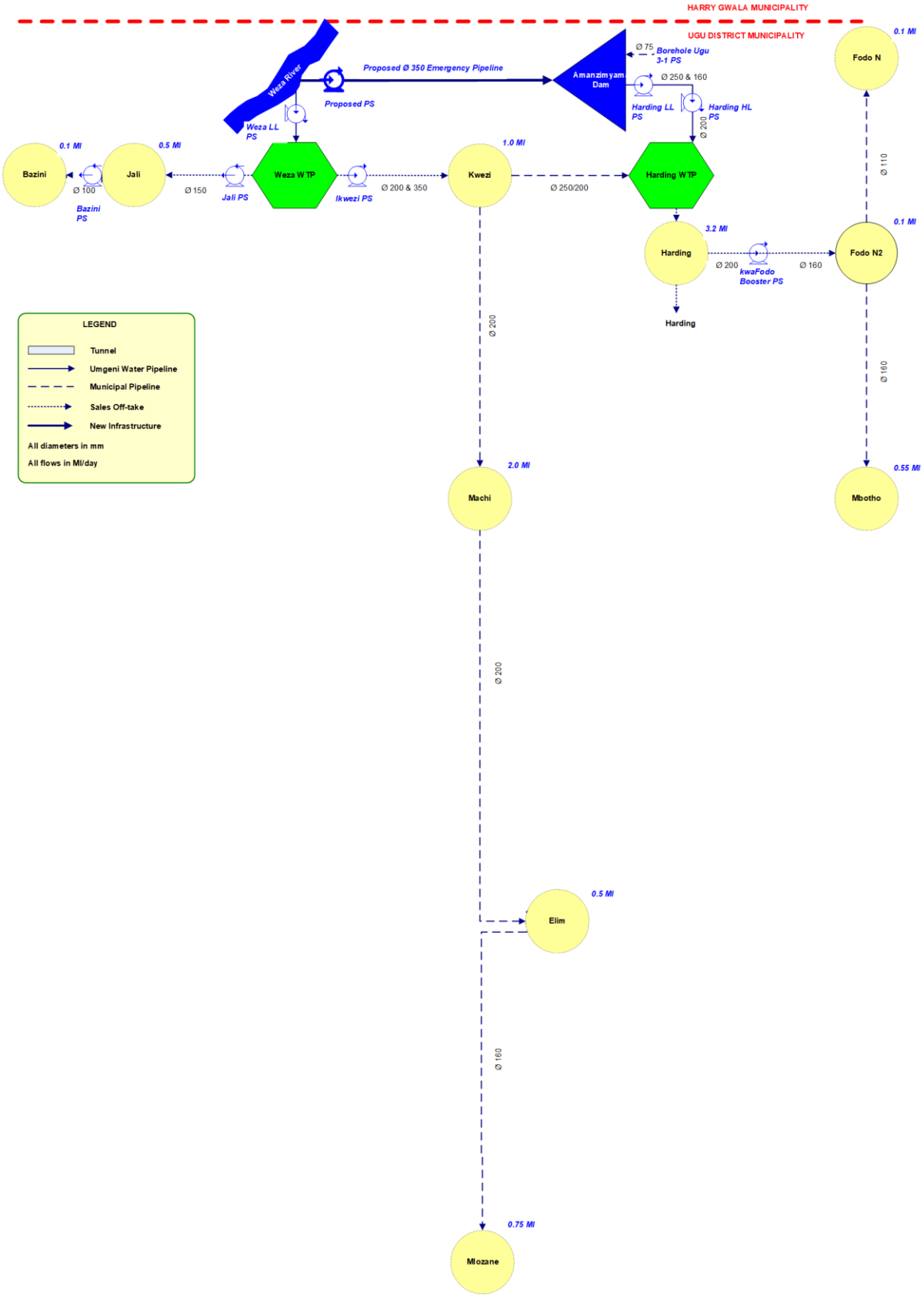


Figure 11.53 Schematic of the Harding-Weza System Bulk Supply Infrastructure.

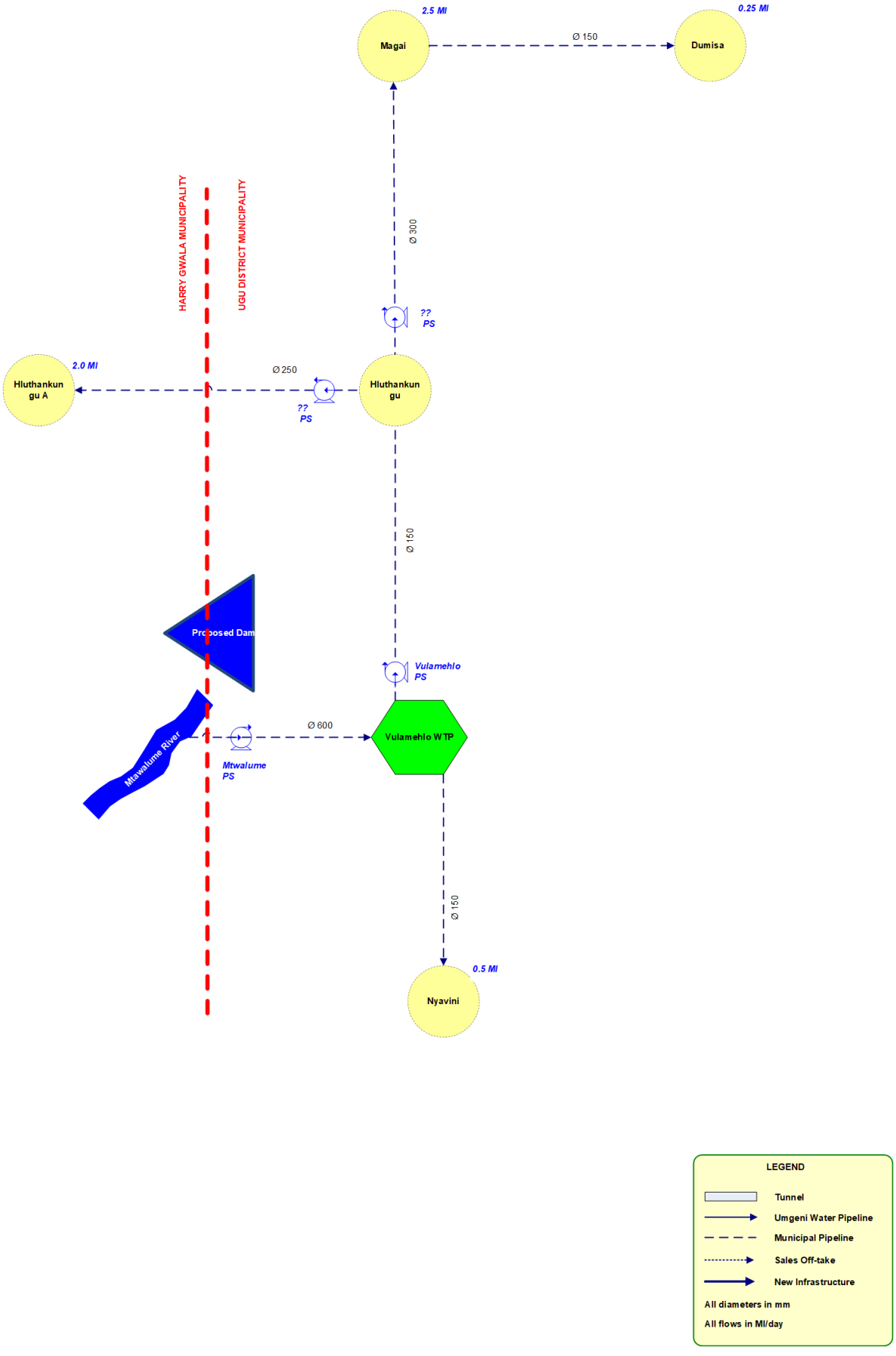


Figure 11.54 Schematic of the Vulamehlo System Bulk Supply Infrastructure.

The water usage per sub-region is summarised in **Table 11.53**, along with the current relevant reservoir storage capacities. Analyses of the historical water sales for the sub regions are illustrated graphically below.

Table 11.53 Water Availability: South Coast System.

Sub Region	Supply System	Infrastructure	Capacity (Mℓ/day)	AADD (Mℓ/day)	Storage Capacity (Mℓ)
Upper	Amanzimtoti*	South Coast Pipeline	59.5	45.8	25.0
Middle	Craigieburn**	n/a	n/a	n/a	n/a
Middle	Umzinto***	WTP	13.6	10.2	5.0
Middle	Mtwalume***	WTP	9.5	12.4	0.9
Lower	Mhlabatshane	WTP	4.1	5.5	2.0
Lower	uMzimkhulu	WTP	81	45.7	10.5**
Lower	uMtamvuna	WTP	20 (30)	18.4	5.0
Lower	Harding-Weza+++	WTP	6.4	5.2+	2.1++
Lower	Vulamehlo+++	WTP	3.0 (5)	2.8	0.4++

* eThekwini 35.3 Mℓ/day and Ugu 10.5 Mℓ/day
** Decommissioned, supplied from Amanzimtoti System
*** This indicates that the WTP is operating at full capacity
\+ Weza 4.0 Mℓ/day and Harding 1.5 Mℓ/day
++ Inadequate on-site potable water storage
+++ This indicates that the WTP is operating at full capacity

The data available to perform the typical water sales forecast, for the Lower South Coast Systems, was highly variable and reliable water consumption trends for the various WTP's could not be ascertained. Hence, the historic annual sales volumes were considered and integrated with water demand projections sourced from previous studies, viz.: All towns 2012, UAP2016 and Joat SIV's 2021. Namely, uMzimkhulu, uMtamvuna, Harding-Weza and Vulamehlo WTP's.

11.5.1 Amanzimtoti Supply System

The historical sales to the South Coast System, including a year forecast, from the Amanzimtoti WTP illustrates an AADD demand of 13.0 Mℓ/day (**Figure 11.55**). The sales are up from 6.1 Mℓ/day over the past year. This may be attributed to increased raw water inflows to the WTP since the commissioning of the replacement pipeline from Nungwane Dam. The new pipeline was commissioned during September 2019.

Wiggins WTP (Central Region, Mgeni System), via the SCA pipeline, is used to augment the above potable water sales at Amanzimtoti WTP. Augmentation is necessary to address this previously mentioned shortfall in raw water constraints at Nungwane Dam, as well as limited treatment capacity at Amanzimtoti WTP. As a result, Amanzimtoti WTP operates as both a WTP and a bulk distribution node for the Upper and Middle South Coast sub-regions via the South Coast Pipeline (SCP).

The design capacity of the SCA in-line booster pump station is 97 Mℓ/day, and is currently adequate to augment the shortfall in supply from the Nungwane Dam. With little opportunity for additional

yield from the Nungwane Dam, the economics of operating Amanzimtoti WTP should be investigated once alternative bulk resources are made available on the South Coast.

The design capacity (59.5 Mℓ/day) of the SCP-1 is greater than the current demand of 45.8 Mℓ/day. The SCP-1 starts at Amanzimtoti WTP and terminates at the off-take to the Scottburgh South Reservoir. It serves as the primary conduit for the distribution of bulk treated water for a significant portion of the Upper and Middle South Coast sub-regions. Umgeni Water owns the SCP-1, and is responsible for the operation and maintenance of the pipeline, pump stations and reservoirs. The construction of link pipelines from the metered off-takes on the SCP-1 to the bulk distribution reservoirs is the responsibility of the relevant WSA's.

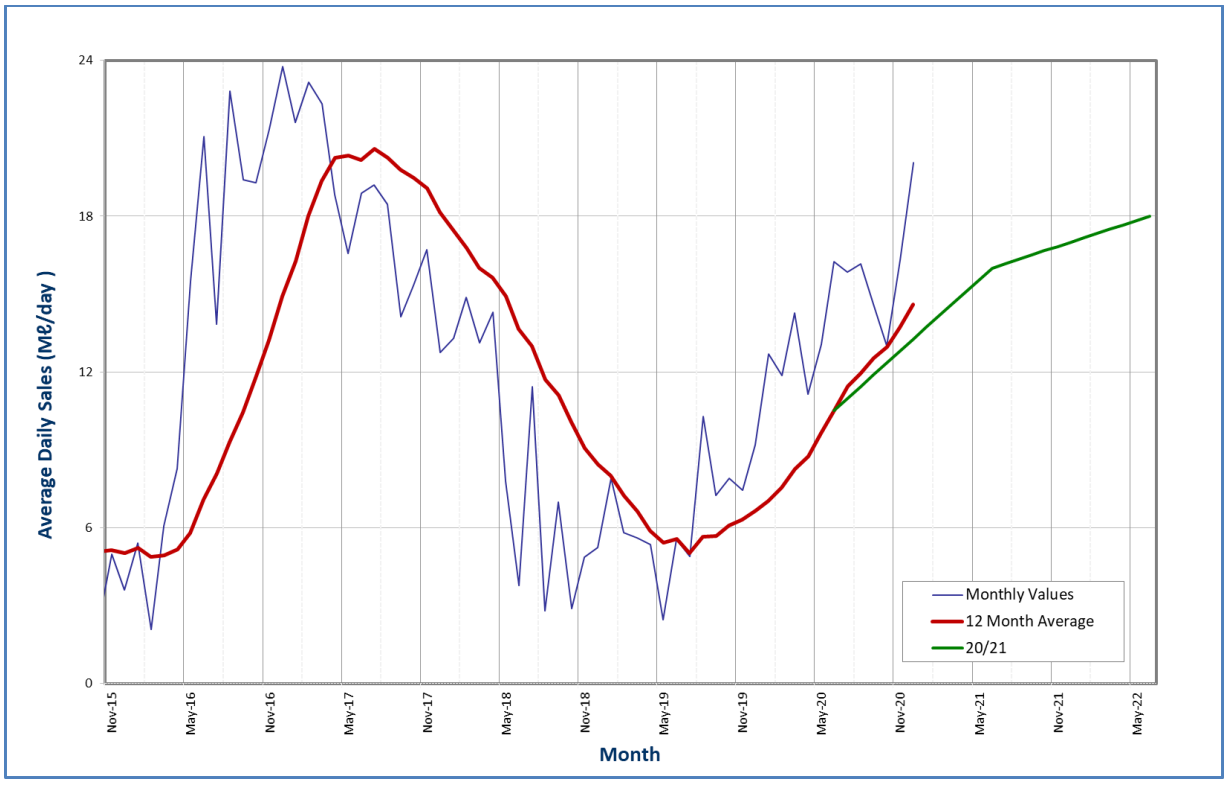


Figure 11.55 Water demand from Amanzimtoti WTP.

11.5.2 Umzinto Supply System

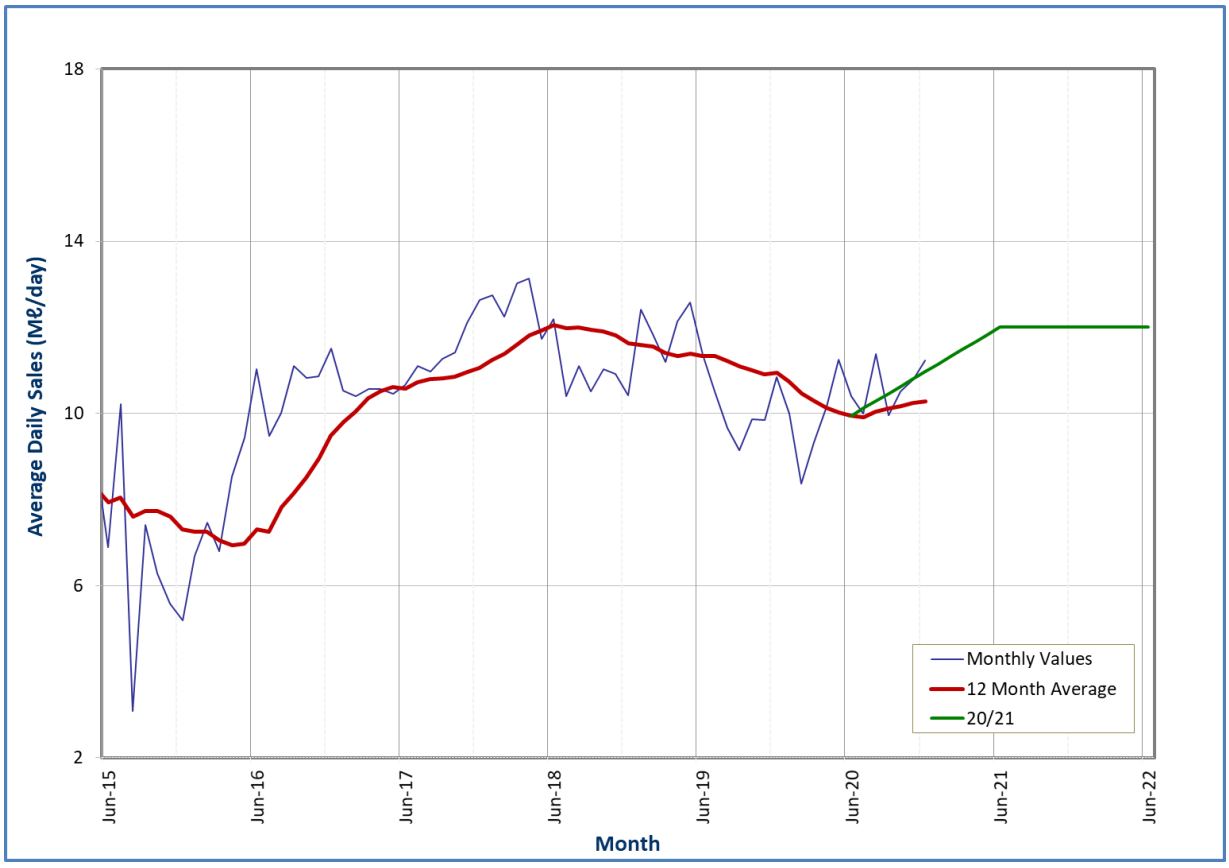
The graph of historical sales, including a year forecast, at Umzinto WTP illustrates a current AADD demand of 10.2 Mℓ/day. The decline in sales may be attributed to the active detection and leak repairs undertaken by Ugu DM. In addition, the DM has experienced challenges in supply to the Malangeni area. The South Coast Pipeline (SCP-2a) assisted in continued supply to the Middle South Coast Region.

The forecast sales growth is constrained by the available supply in the short term. Consequently, the 12-month moving average of sales from the Umzinto WTP is projected to be limited to 12.0 Mℓ/day, i.e. the yield of the water resource (**Figure 11.56**) including the emergency scheme.

Amanzimtoti WTP (Upper Sub Region, Nungwane / Mgeni System) via the SCP-1 pipeline is used to augment the above potable water sales at Umzinto WTP. This may be attributed to the previously

mentioned shortfall in raw water resources at both Umzinto and E.J. Smith Dams. As a result, Umzinto WTP operates as both a WTP and a bulk distribution node for the Middle South Coast sub-region.

The design capacity of the Ellingham-Umzinto link, including in-line booster pump station at Scottburgh South Reservoir is 6.4 Mℓ/day, and is more than adequate to augment the shortfall in supply from the Umzinto and E.J. Smith Dams (**Figure 11.56**). With little opportunity for additional yield from these dams, the raw water supply to Umzinto WTP needs to be investigated / augmented to enable use of the installed treatment capacity.



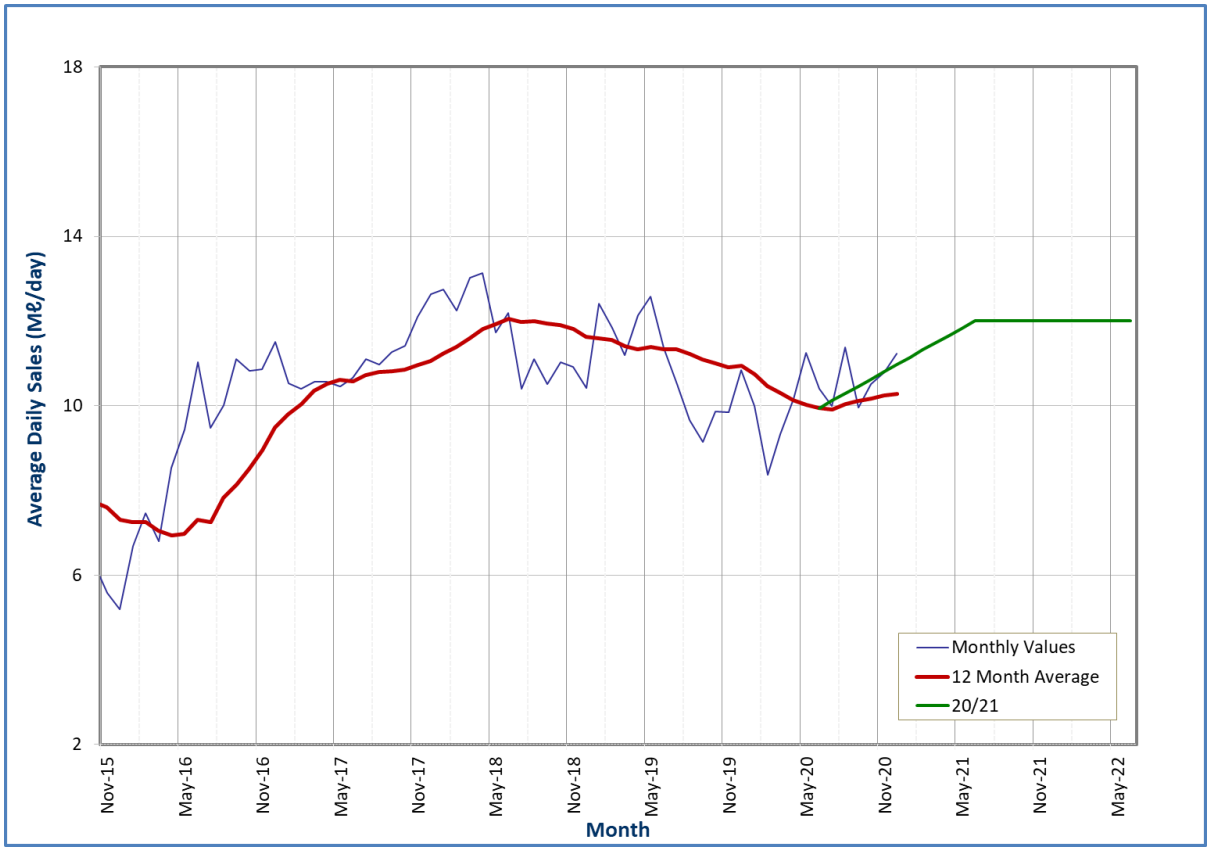
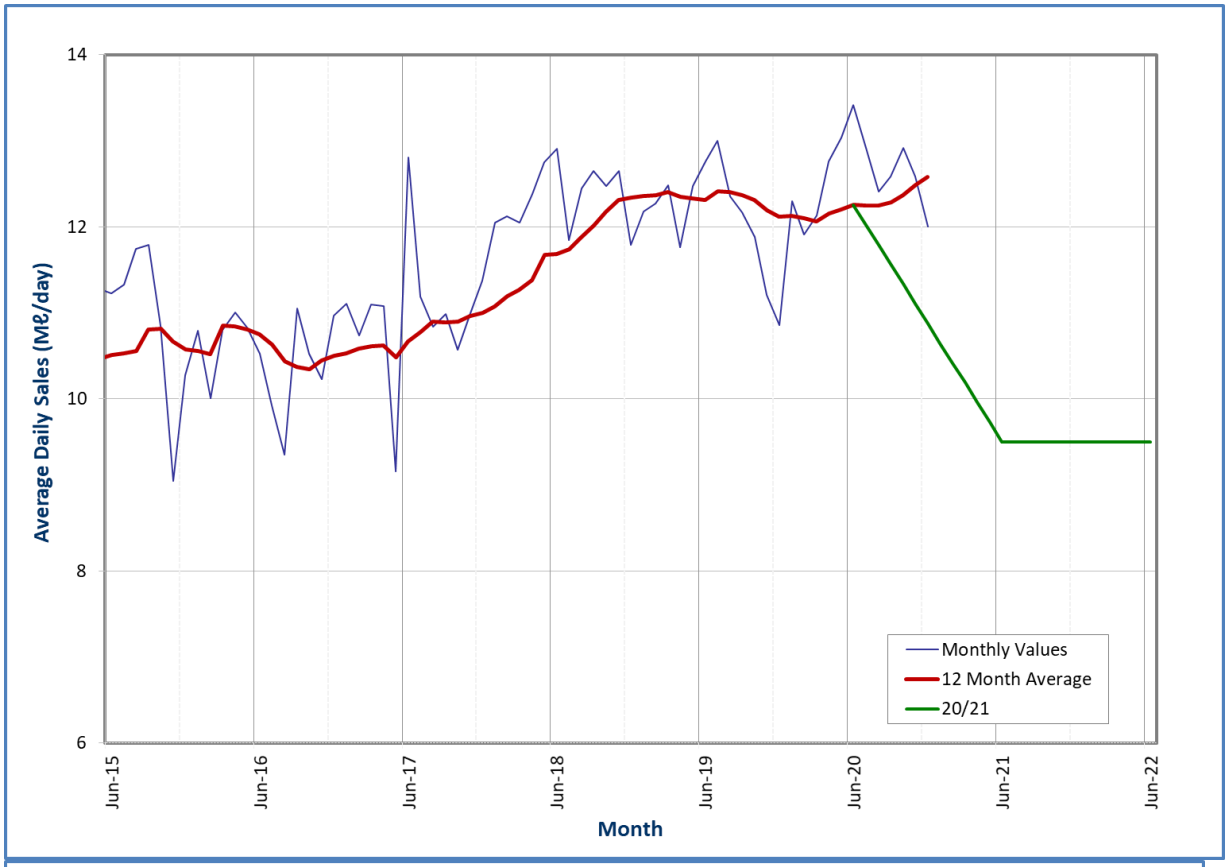


Figure 11.56 Water demand from Umzinto WTP.

11.5.3 Mtwalume Supply System

The graph of historical sales, including a year forecast, at Mtwalume WTP illustrates an AADD demand of 12.4 Mℓ/day. Sales peaked at 13.4 Mℓ/day in June 2020. The 12-month moving average of sales from the Mtwalume WTP is limited to the current water resource supply (**Figure 11.57**).

Umzinto WTP (Middle Sub Region) via a pipeline linking the Bazley Reservoir to the Elysium Reservoir supply zone is used to augment the potable water sales at Mtwalume WTP. Augmentation is required to address the previously mentioned shortfall in raw water resources from the run-of-river abstraction. Despite the limited water availability, the infrastructure at Mtwalume WTP is also being operated at maximum capacity. As a result, any growth in water demand has to be curtailed. The bulk supply and distribution infrastructure should to be reviewed.



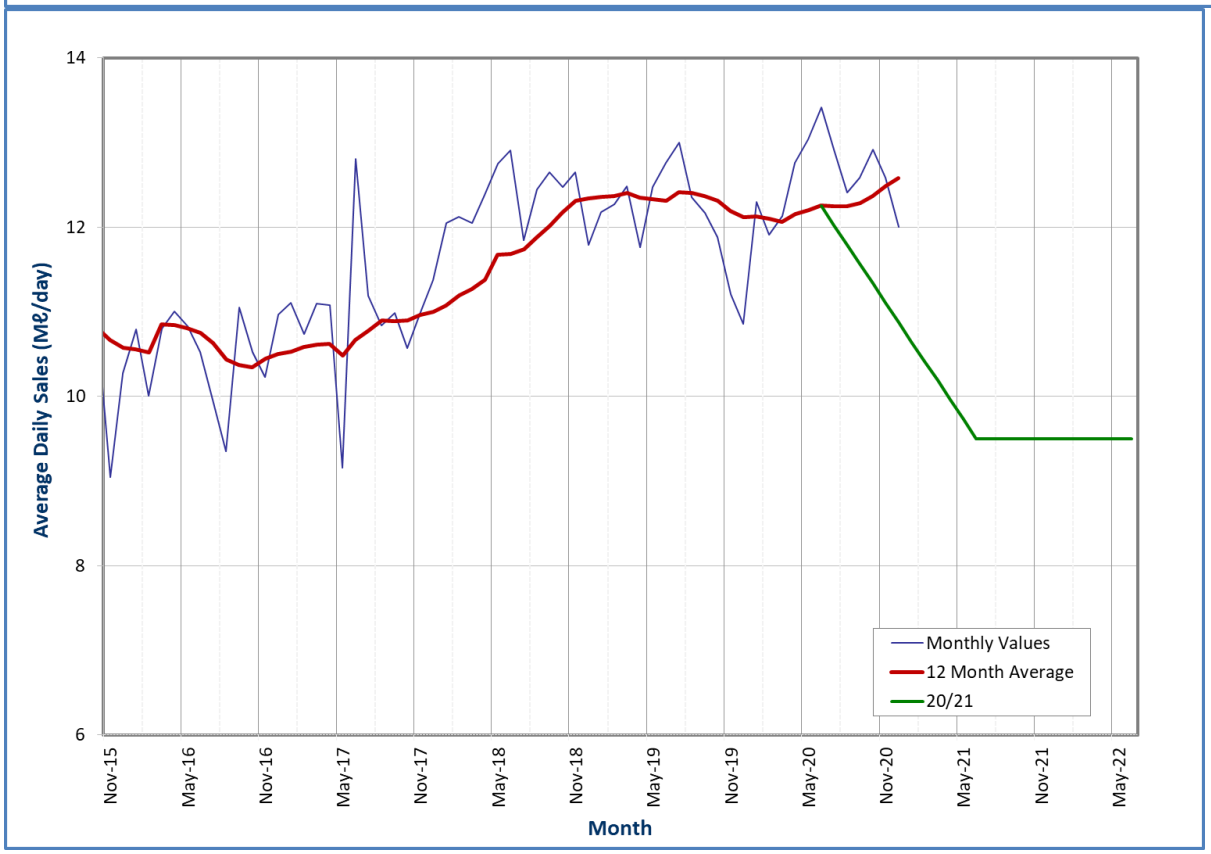


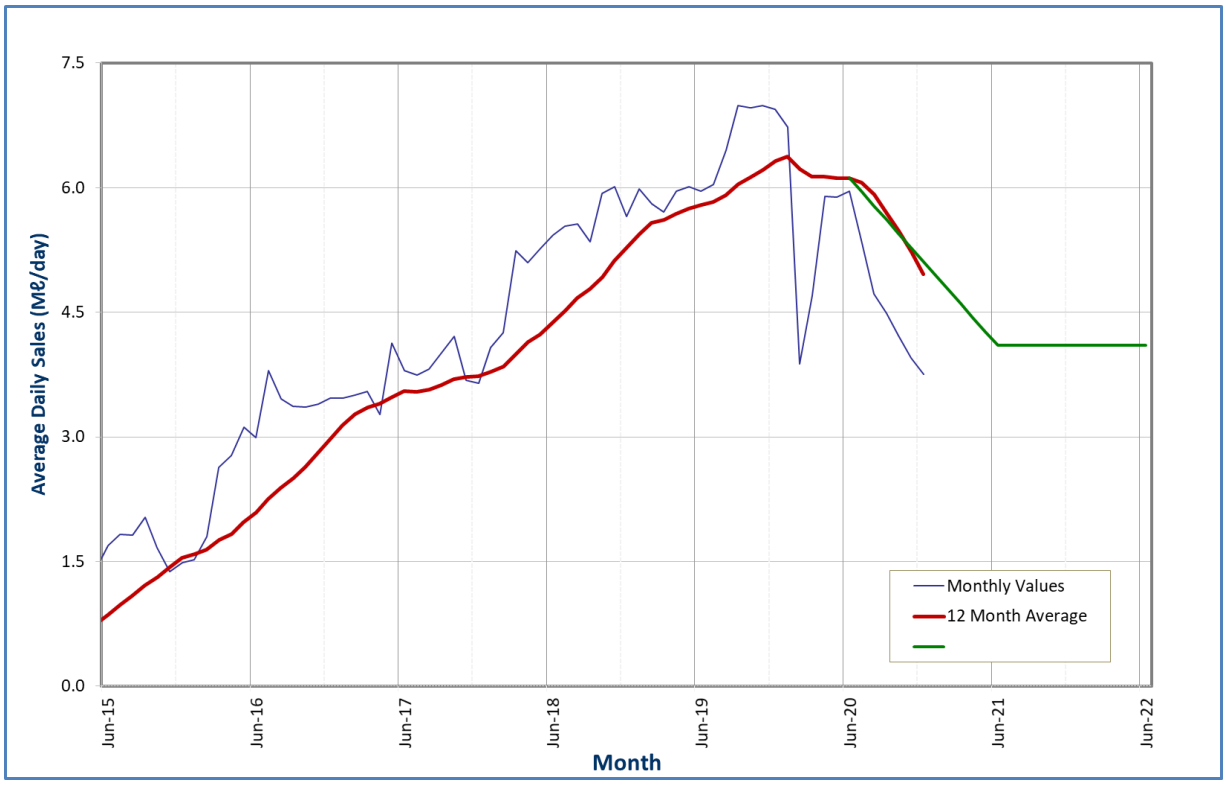
Figure 11.57 Water demand from Mtwalume WTP.

11.5.4 Mhlabatshane Supply System

The graph of historical sales, including a year forecast, at Mhlabatshane WTP illustrates an AADD demand of 5.5 Mℓ/day. Sales peaked at 6.0 Mℓ/day in June 2020. The projected 12-month moving average of sales from the Mhlabatshane WTP Phase 1 was limited to the assured yield of the water resource supply, viz. 4.1 Mℓ/day (**Figure 11.58**).

The current supply and associated infrastructure are deemed sufficient to supply the projected water demands. However, the WSA has confirmed the escalating extent of connections to new water supply zones by Ugu DM, as well as the physical water loss volumes. This is predominately due to operational and raw water supply issues being experienced in the uMzimkhulu Supply System. The Mhlabatshane and uMzimkhulu Systems are now interlinked. This has resulted in demands exceeding the yield at a 1:50 year assurance level and as a consequence there will be a higher risk of non-supply or the need for restrictions in dry years.

Despite limited water availability, the infrastructure at Mhlabatshane WTP is also being operated at maximum capacity. As a result, any growth in demand will need to be curtailed.



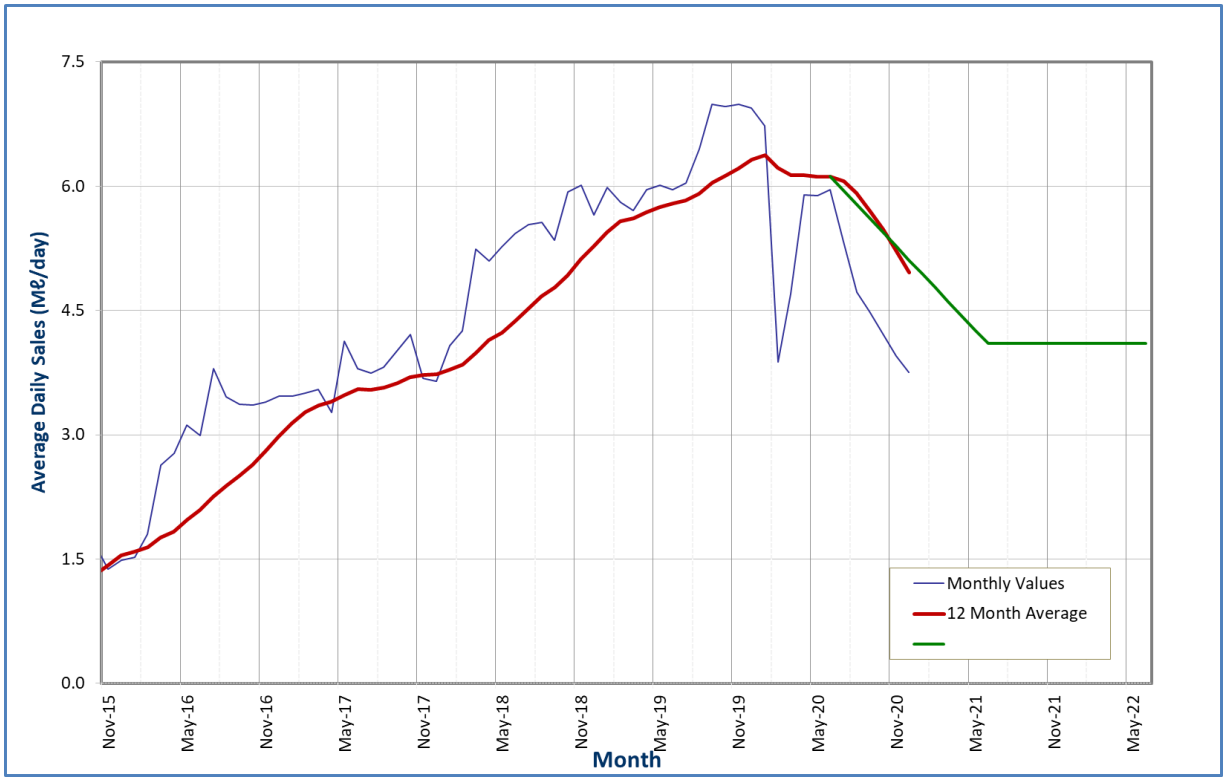


Figure 11.58 Water demand from Mhlabatshane WTP.

11.5.5 uMzimkhulu Supply System

The historical annual sales to the uMzimkhulu Supply System from the Bhobhoyi WTP illustrates an AADD of 59.2 Mℓ/day (**Figure 11.59**). Sales peaked at 61.0 Mℓ/day in December 2019. The projected 12-month moving average of sales from the Bhobhoyi WTP is limited by the assured yield of the water resource supply, viz. 50.1 Mℓ/day (**Figure 11.41**).

During above-normal rainfall years the yield, current abstraction and associated WTP infrastructure is sufficient to supply the projected water demands. During dry years, however, restrictions are required in this system as the infrastructure capacity and demand for water exceed the yield. It is also evident that, from the four year forecast shown in **Figure 11.59**, the difference between the assured yield of 50.1 Mℓ/day and the projected demand increases thereby exacerbating the risk of non-supply.

Augmentation is required to address the previously mentioned shortfall in raw water availability at St Helen's Rock. The Ncwabeni OCS Dam is a project planned by DWS to augment supply to the uMzimkhulu River during dry periods. This project would increase the yield of the raw water supply system and reduce the risk of non-supply during dry periods.

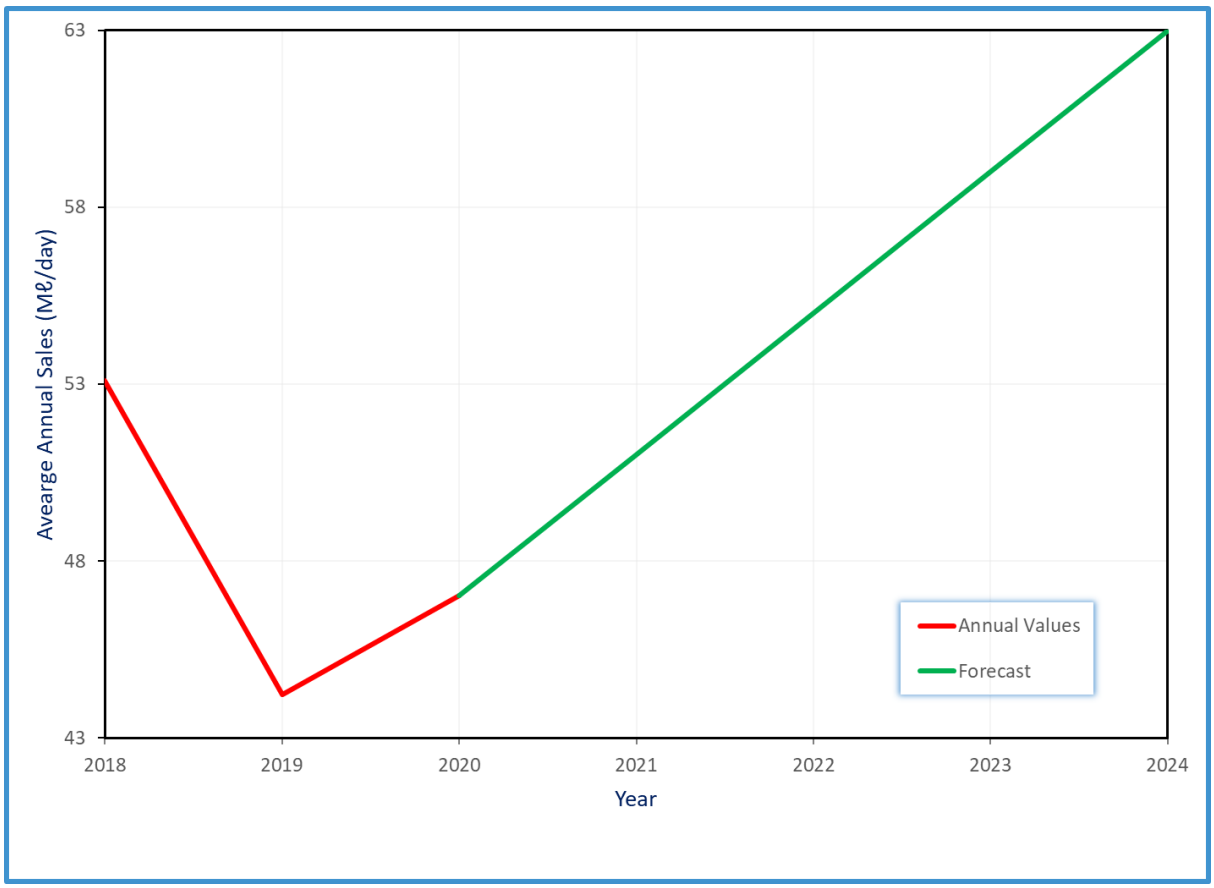


Figure 11.59 Water demand from Bhobhoyi WTP.

11.5.6 uMtamvuna Supply System

The graph of historical annual sales, including a four year forecast, at uMtamvuna WTP illustrates a current AADD demand of 20.5 Mℓ/day. Sales peaked at 22.9 Mℓ/day in March 2019 (**Figure 11.60**). The long term decline in actual sales may be attributed to both the condition and associated capacity of the abstraction works, WTP and supply infrastructure. In addition, the electrical power network is prone to power failures.

The four year demand forecast follows the same trend as the historical sales (**Figure 11.60**). Provision has been made to upgrade the abstraction and treatment capacity by an additional 20 Mℓ/day (in two modules).

The current raw water availability is deemed sufficient to supply the projected water demands. This will, however, be subject to confirmation of the extent of connection to new water supply zones by Ugu DM, as well as the physical water loss volume. Despite the raw water availability, the infrastructure at uMtamvuna WTP is being operated at maximum capacity, pending commissioning of the upgrade to the WTP and abstraction facilities. As a result, any growth in water demand has to be curtailed.

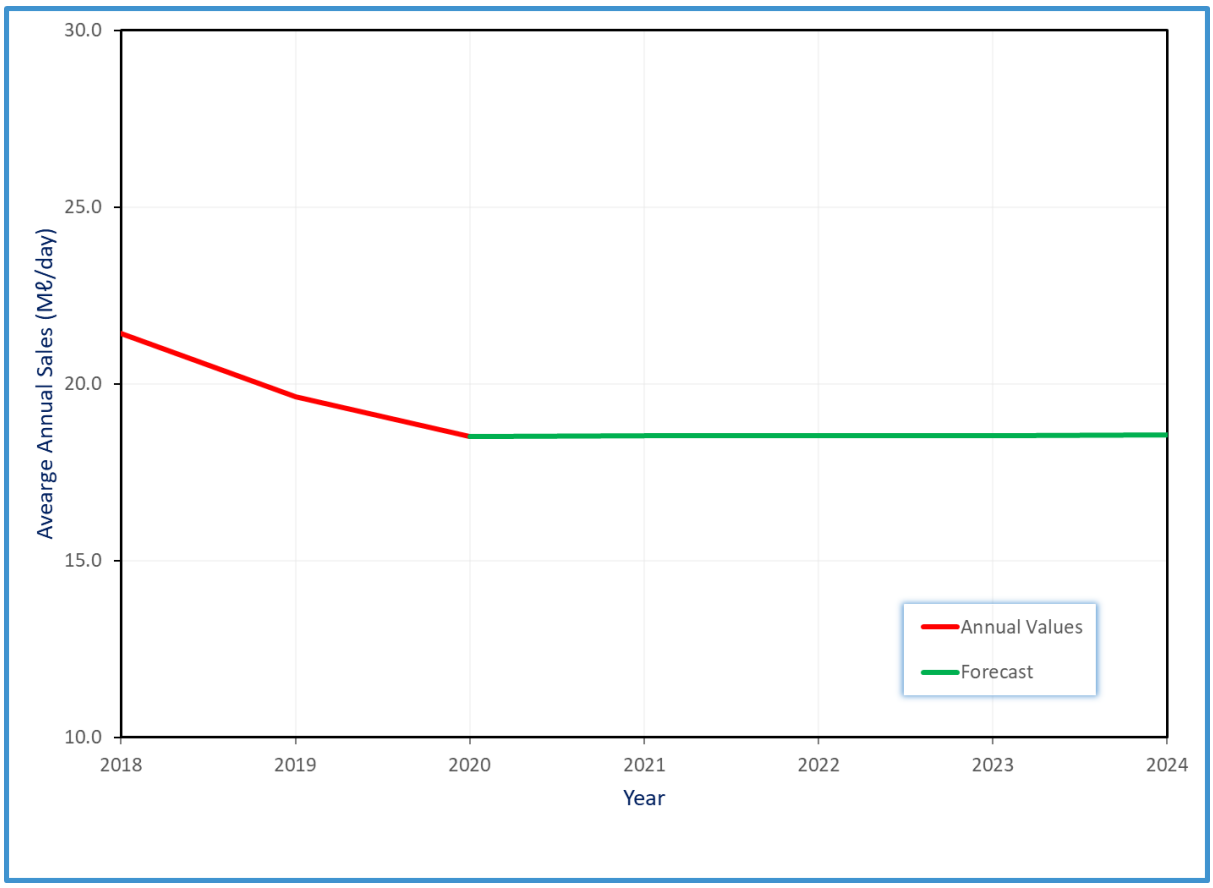


Figure 11.60 Water demand from uMtamvuna WTP.

11.5.7 Harding-Weza Supply System

A graph of historical annual sales, including a four year forecast, for the combined Harding-Weza WTP's, illustrates an AADD demand of 3.1 Mℓ/day. Sales peaked at 5.3 Mℓ/day in July 2019. This demand is expected to increase significantly over the next four years if resource constraints can be addressed (Weza River Raw Water Emergency Scheme is commissioned by mid-2020). Currently the sales volumes have been limited by the current water resource supply (**Figure 11.61**).

There is an estimated 2.5 Mℓ/day suppressed demand within the Harding Town, primarily attributed to the fact that the Amanzimnyama (Harding) Dam has not increased much above the dead storage level over the past year. As a result of this limited water availability, the infrastructure at Harding WTP is being operated well below capacity and any growth in water demand has to be curtailed until construction of the proposed raw water emergency scheme.

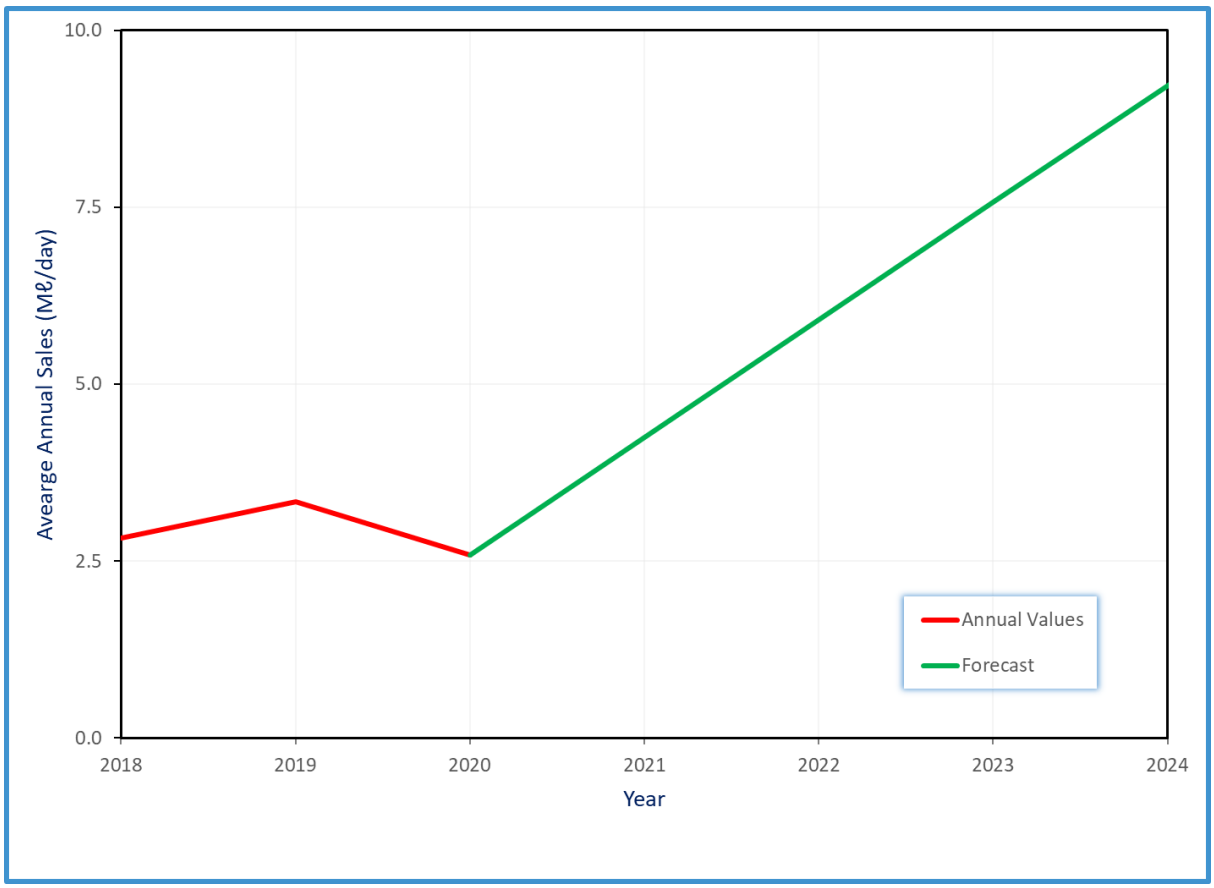


Figure 11.61 Water demand from Harding-Weza WTP.

11.5.8 Vulamehlo Supply System

The graph of historical annual sales, including a four year forecast, at Vulamehlo WTP, illustrates an AADD demand of 2.6 Mℓ/day. Sales peaked at 2.9 Mℓ/day in May 2019. The projected demand is expected to increase over the next four years to a maximum 4.6 Mℓ/day (**Figure 11.62**).

The current supply and associated infrastructure are deemed sufficient to supply the projected water demands. This will, however, be subject to confirmation of the extent of connection to new water supply zones, by Ugu DM, as well as the physical water loss volume. In addition, confirmation of the existing run-of-river yield at a 1:50 year assurance level still has to be determined in a hydrological study.

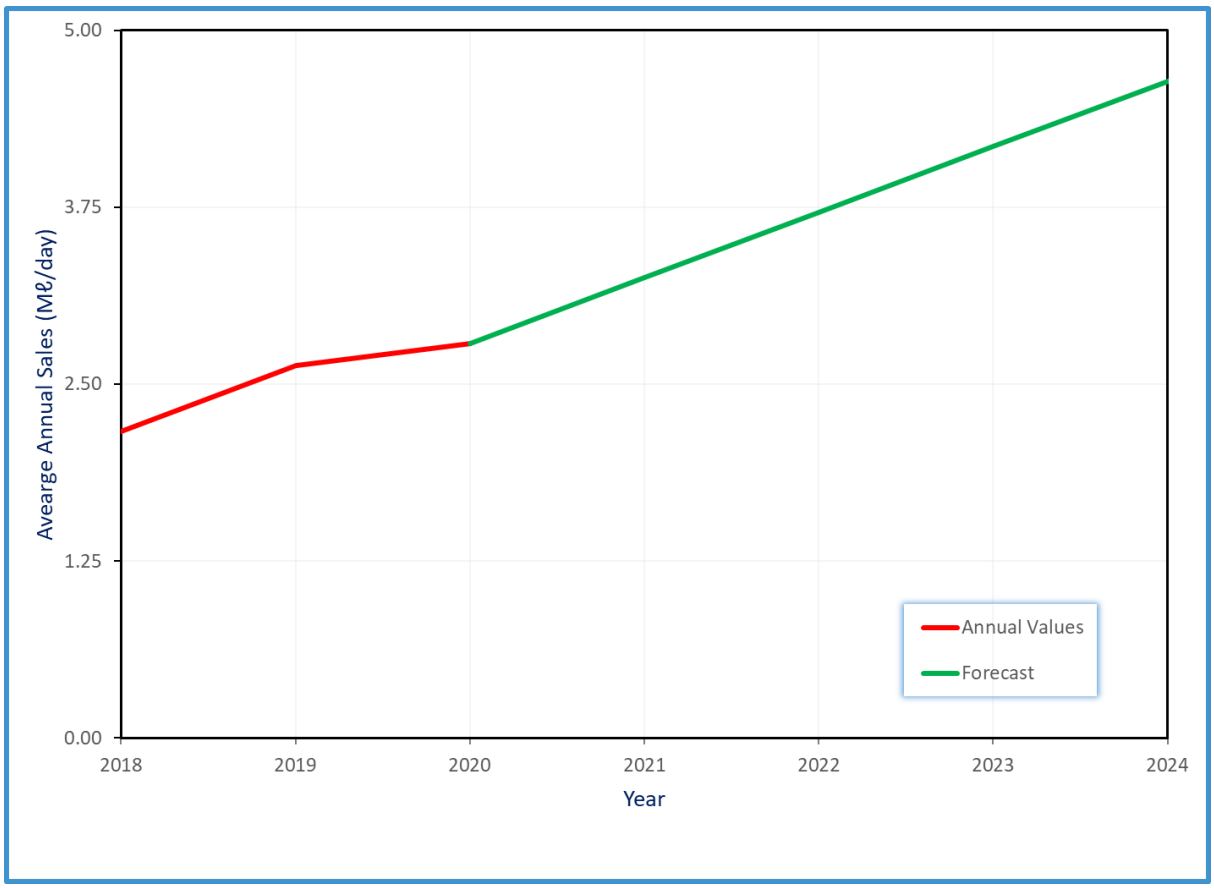


Figure 11.62 Water demand from Vulamehlo WTP.

11.5.9 Summary

Conclusions relating to water usage and demand estimates (water availability) within the Upper and Middle South Coast System are as follows:

- This system has to be viewed holistically due to the interdependency and augmentation between the sub regions. Any inadequacy of one section of the infrastructure is likely to place strain on the upstream sections.
- The economics of operating Amanzimtoti WTP should to be investigated when the raw water supply constraints have been alleviated.
- Any growth in water demand from Mtwalume and Mhlabatshane WTPs could be curtailed as a result of inadequate supply or resource capacity. Treated water from the WTPs is sold to Ugu District Municipality "at the fence" and they are responsible for distribution within the entire network from the WTP's. In order to better understand these networks, the Ugu DM's bulk supply and distribution infrastructure should be reviewed (refer **Section 11.5.4**).
- Peaks in water demand are likely to adversely affect the Umzinto, Mtwalume and Mhlabatshane WTP supply systems.
- Reservoir storage requires evaluation with the sub regions.

Conclusions relating to water usage and demand estimates (water availability) within the Lower South Coast System are:

- Historical demand information cannot be accepted with a high level of confidence. As a result, the water consumption trends and forecasts must be acknowledged with this in mind.
- WDM issues affect all supply areas.
- This system has to be viewed holistically due to the interdependency and augmentation between the sub regions. Any inadequacy of one section of the infrastructure is likely to place strain on upstream systems.
- The majority of the bulk water infrastructure has reached capacity and requires timeous upgrading or augmentation.
- The economics of transferring water from the uMtamvuna region to the uMzimkhulu region should be investigated in the short-term until such time the raw water supply constraints is alleviated via the Ncwabeni OCS Dam.
- Any growth in water demand from Bhobhoyi, Harding-Weza and uMtamvuna WTPs could be curtailed as a result of inadequate supply or resource capacity. Treated water is distributed within the entire network from these WTP's. In order to better understand these networks, the Ugu DM's bulk supply and distribution infrastructure should be reviewed (refer **Section 11A.5.4**).
- Peaks in water demand are likely to adversely affect all four WTP supply systems.
- Reservoir storage requires evaluation with the sub regions.

Assessing demands by historical sales from WTP's includes water losses within the distribution network. The quantum of water loss is unknown, although, effective WCDM measures are required to allow the current systems to meet demands in the short term. A DWS study, during 2018, estimated the Ugu DM non-revenue water to comprise of 40% by volume. This correlates with the 2019/2020 Ugu DM Financial Year average of 39.8% by volume; as presented in the Ugu Water Recovery plan, dated 25 September 2020. If correct then effective WCDM measures would allow the current systems to meet demands in the short term, as current supply side measures have been exhausted suggesting that demand side measures require urgent attention.

11.6 Water Balance/Availability

The water resources availability and projected demands are summarised in **Figure 11.63** for the Upper and Middle South Coast Systems.

The current (2020) supply volume for the Upper and Middle South Coast Water Supply System averaged 105 Mℓ/day. This supply excludes an estimated 25 Mℓ/day suppressed demand in the supply area due to infrastructure constraints. Existing water sources to supply the requirements are:

- Local sources in the form of the three small to medium dams (Nungwane, Umzinto and E.J. Smith) and a run-of-river abstraction from the Mtwalume River, and
- the South Coast Augmentation scheme (SCA) from the neighbouring Mgeni System.

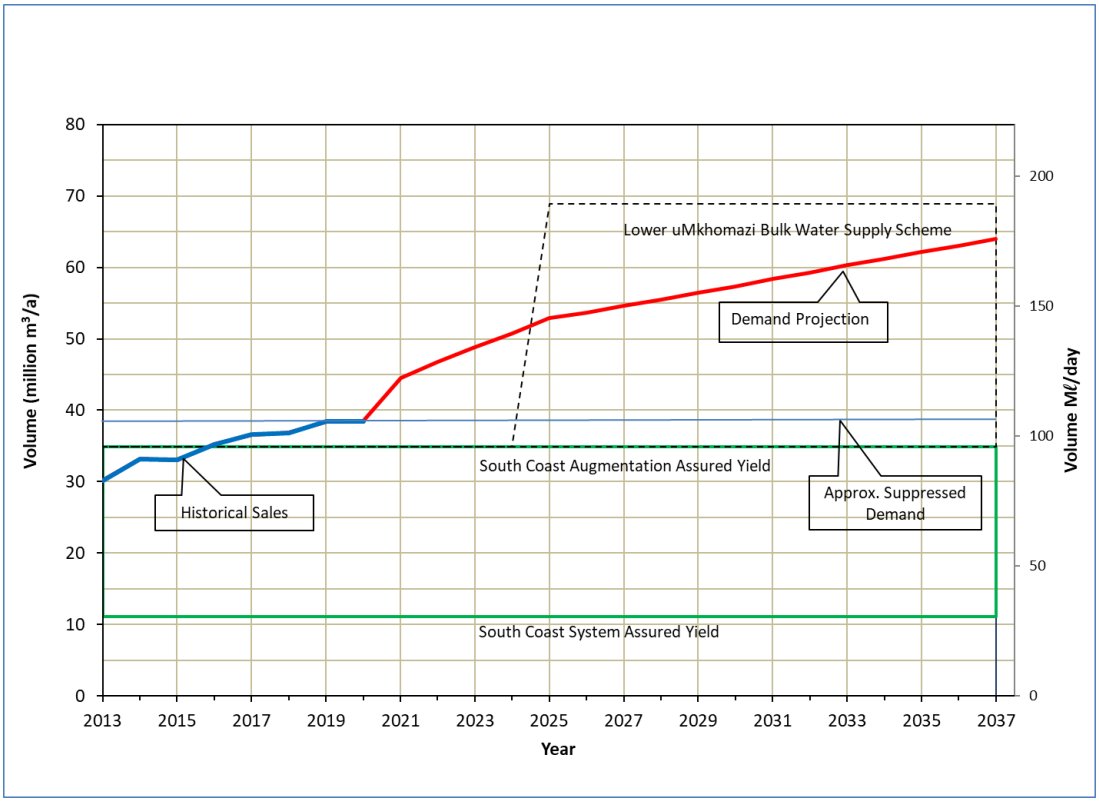


Figure 11.63 Upper and Middle South Coast water requirement projection scenarios.

The current yield of the Upper and Middle South Coast System is approximately 90 Mℓ/day. As a result, a new water resource, such as the Lower uMkhomazi BWSS, is required to avoid the likely impact of water supply limiting growth and development. The 30 year water demand projection is anticipated to be between 155 and 205 Mℓ/day for the supply area. Considering the existing water sources, the proposed Lower uMkhomazi BWSS yield will have to provide a volume of 100 Mℓ/day to meet the growth in water requirements over the ensuing 30 years.

The water resource availability and projected demands are summarised for the entire Lower South Coast System in **Figure 11.64**. The current (2020) supply volume for the Lower South Coast Water Supply System averaged 72 Mℓ/day. This supply excludes an estimated 12.5 Mℓ/day suppressed demand in the supply area (which is as a result of infrastructure constraints). The source of existing raw water is from the following run-of-river abstractions:

- uMtamvuna River
- uMzimkhulu River
- Weza River
- uMtwalume River

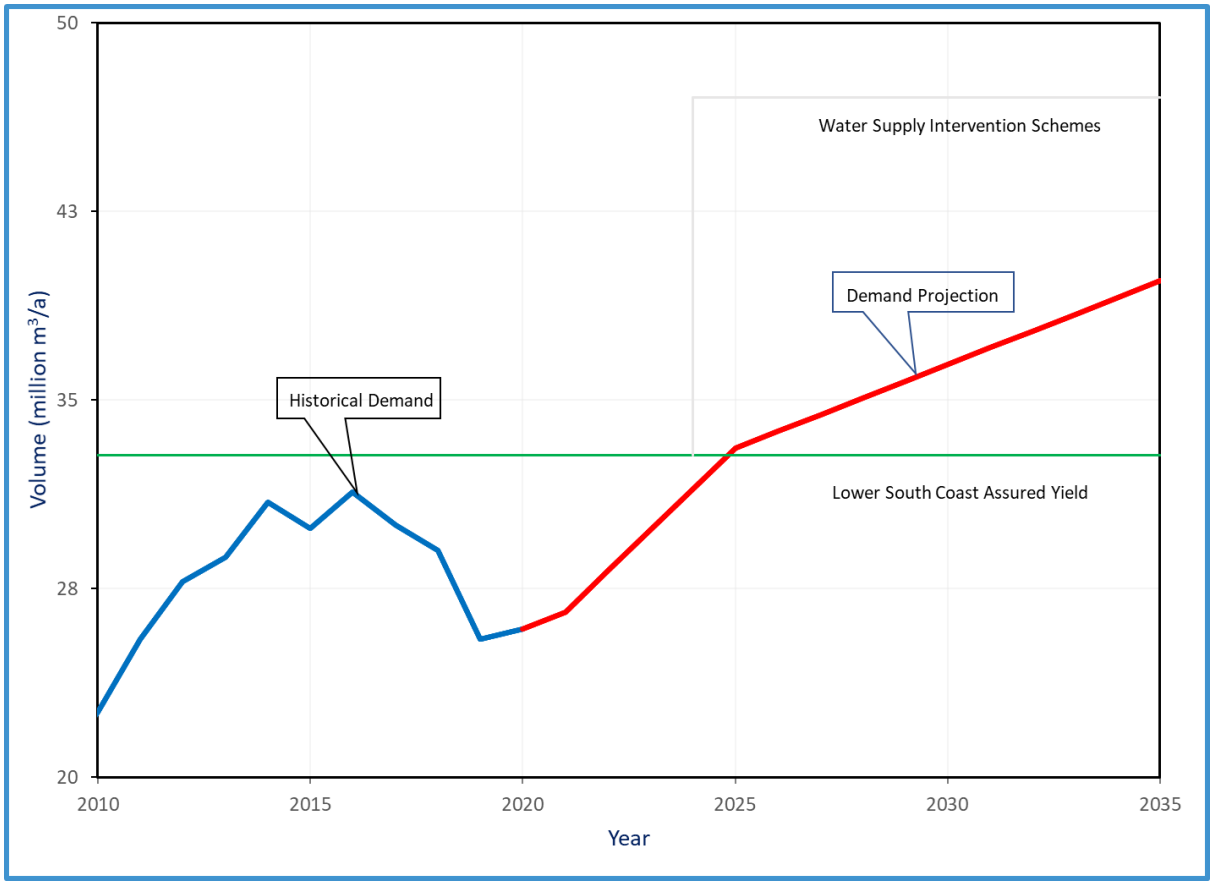


Figure 11.64 Lower South Coast water requirement projection scenarios.

The current yield of the Lower South Coast System is approximately 90 Mℓ/day. As a result, a new water resource, such as the proposed Ncwabeni OCS Dam, is required to avoid the likely impact of water supply limiting growth and development. The 30 year water demand projection is anticipated to be exceed 132.5 Mℓ/day for the supply area. Considering the existing water sources, the uMzimkhulu BWSS yield will have to provide an additional volume of 30 Mℓ/day to meet the growth in water requirements over the ensuing 30 years.

11.7 Recommendations for the South Coast System

11.7.1 Reconciliation of Available Water Resources and Water Requirements

The South Coast System includes two large river systems (uMzimkhulu and uMkhomazi), and several smaller river systems (e.g. uMtwalume). A map showing the location of these river systems, in comparison with the large and medium-sized river systems of the uThukela and Mgeni is provided in **Figure 11.65. Figure 11.65** also illustrates the mean annual runoff of the various key river systems.

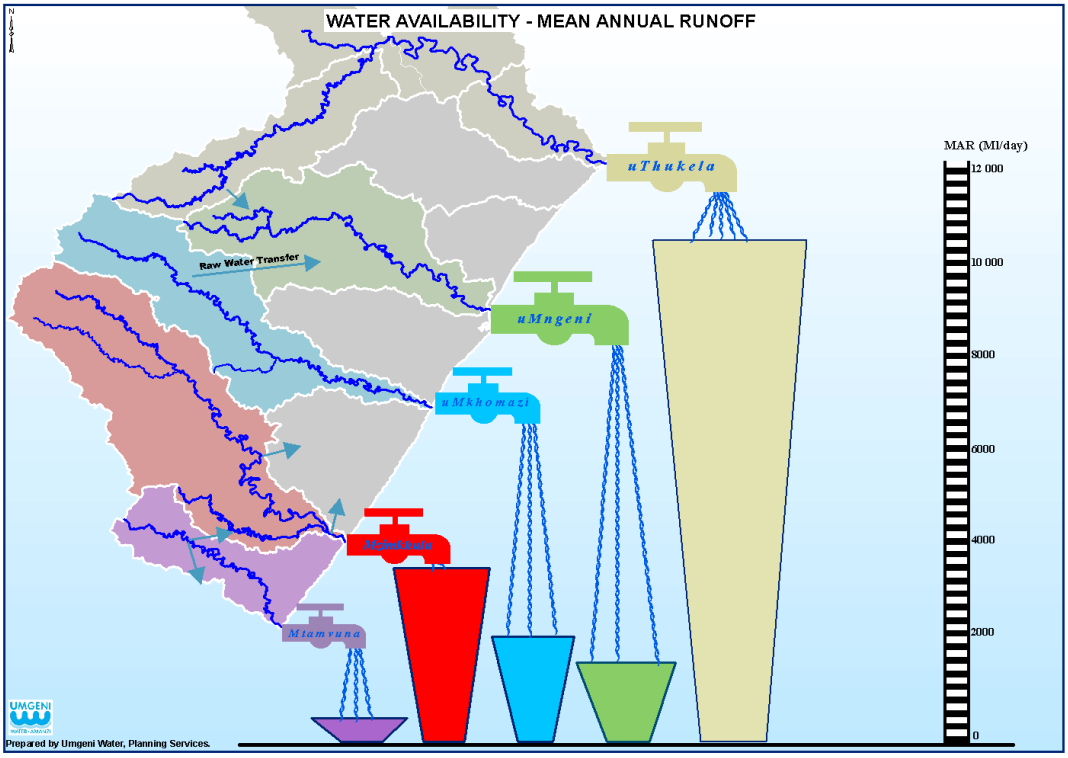


Figure 11.65 Water Availability – Mean Annual Runoff.

With the exception of the Mgeni River catchment, which is fully developed from a water resources perspective, there is potential for new dams in a number of other catchments. Some of the dams, which have already been investigated, include the Smithfield and Impendle Dams on the uMkhomazi River. The lower coastal regions of the uMtamvuma, uMzimkhulu and uMkhomazi River catchments have, in recent times, been investigated by DWS for possible off channel storage dam sites; the water resources of these catchments are underdeveloped and in this respect these catchments offer potential for development.

A map showing the water resource situation (availability, requirements, water balance and reconciliation) for Lower South Coast River Systems is provided in **Figure 11.66**. Comparison is made with the fully developed Mgeni River catchment. **Figure 11.66** includes a summary break down of the water requirements per sector, as well as available water resource infrastructure.

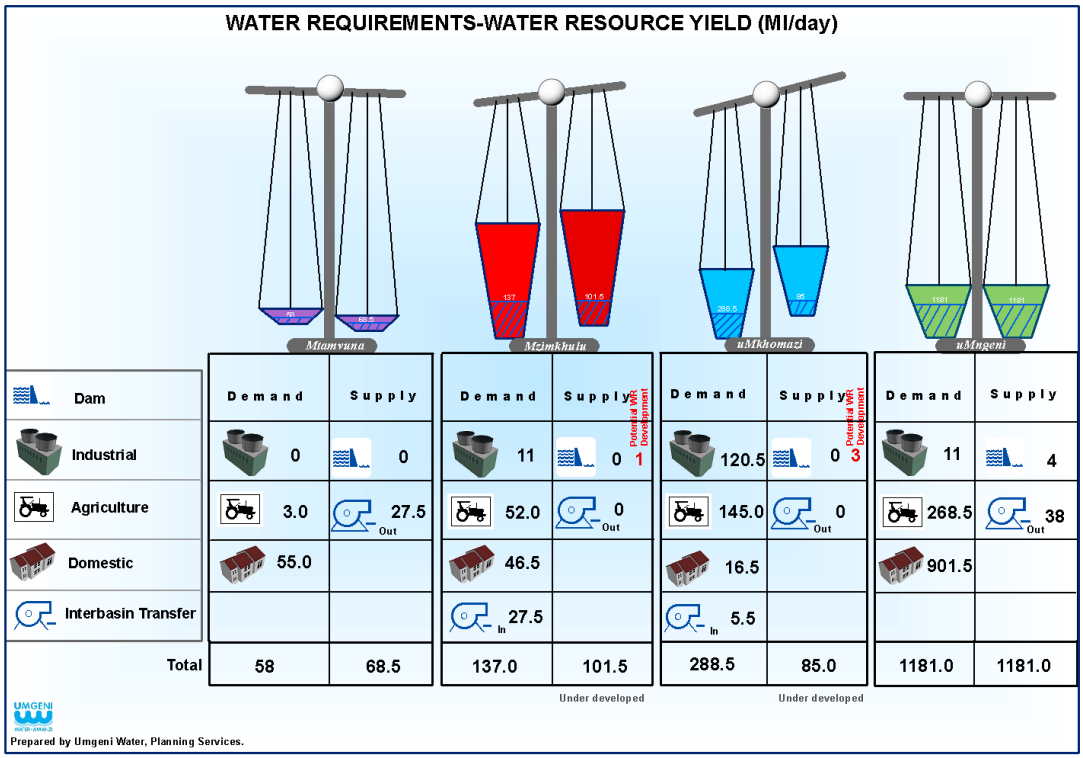


Figure 11.66 Water Requirements versus Water Resource Yield.

Despite the large natural runoff of the uMkhomazi catchment (1 038 million m^3/a), the catchment is now allocated to either licenced water use or environmental flows. There is, hence, no water available for new water allocations, unless accompanied by the provision of new storage. The seasonal shortages within the coastal regions could be overcome through the provision of off-channel storage to augment dry-season run-of-river abstractions. As a longer-term solution, water may be obtained from the Smithfield Dam when constructed for augmentation of the Mgeni System.

Indications are that the natural river flow of the uMzimkhulu catchment, during dry periods, may not be sufficient to meet the requirements of Port Shepstone, being dependent on run-of-river abstractions (salt water ingress experienced during 2014/15 drought; due to abstractions at St Helen's Rock exceeding the river flowing into the estuary). The uMzimkhulu is a largely undeveloped catchment with high natural runoff (1 445 million m^3/a). The potential therefore exists to develop the resource for economic development, poverty eradication or transfer to other catchments in the distant future.

The Universal Access Plan (UAP) Phase 2 and Phase 3 for Ugu DM considered the adequacy of existing water resources and primary bulk infrastructure (including the Lower South Coast). The projected demands in the uMzimkhulu System are expected to exceed the capacity of the existing water resource yields and infrastructure capacity and alternative sources of water will have to be identified / implemented. **Figure 11.67** and **Figure 11.68** provide a summary of the UAP findings and proposed highest priority projects to implement for backlog alleviation. The aforementioned off-channel storage dams were included in the study recommendations. The off-channel storage dams are considered strategic projects for UW from a water resources perspective. **Figure 11.65** illustrates the "untapped" water resources and, as a result, potential exists to both develop the water resources and address poverty eradication.

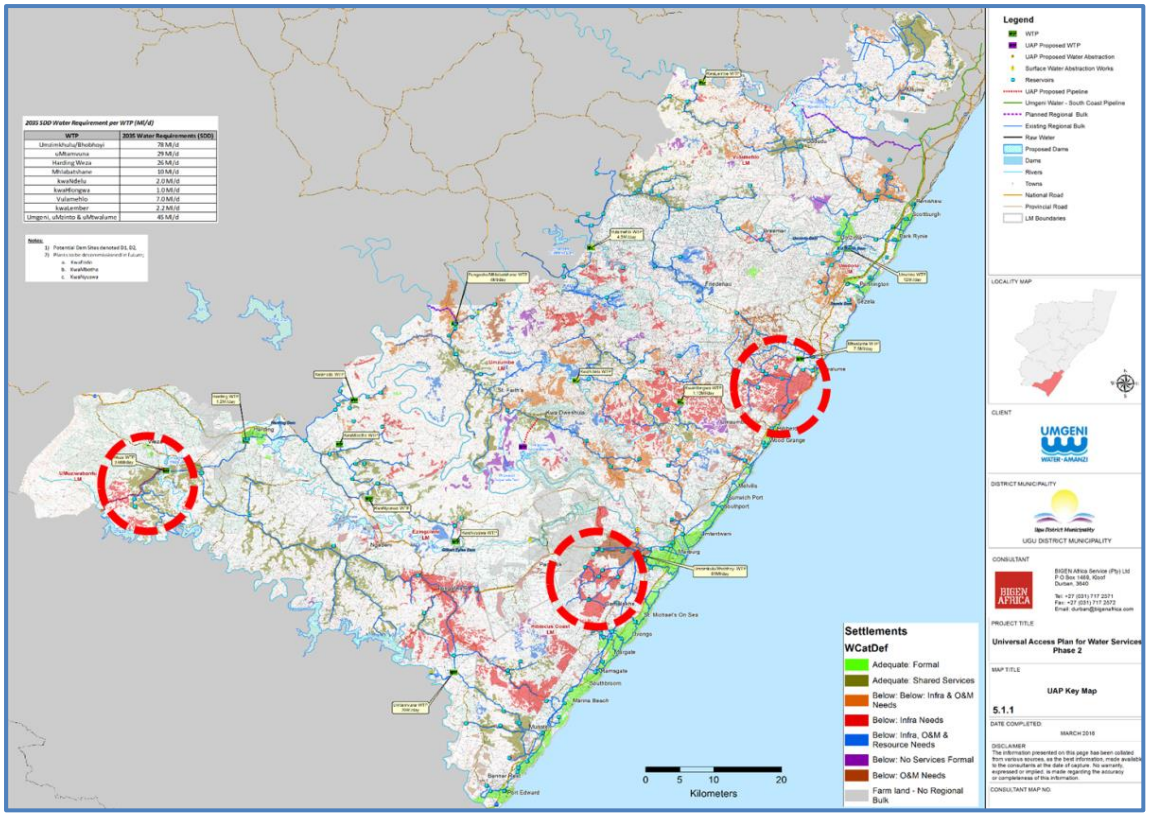


Figure 11.67 Water Services below Infrastructure, O&M and Resource Needs (2016).

Figure 11.68 Water Service Intervention Areas (2016).

It is shown above that, additional water resource infrastructure will have to be developed in the catchments of the South Coast System to meet the future yield requirements. In addition, potable water infrastructure will also have to be developed to meet the future demand requirements of the area.

(a) Water Balance (Short to Medium Term Plans)

The water supply augmentation plans, that will enable the full utilisation of treatment capacity include:

Upper and Middle South Coast Systems

- Supply raw water to Umzinto WTP from adjacent catchments (Mpambanyoni River). The "moth-balled" emergency scheme should be utilised in a more permanent manner even though this supply is limited to run-of-river.
- Create additional storage and/or reduce demands at Mtwalume WTP or, install a 5 Mℓ/day desalination package treatment plant at Elysium.
- Continue to utilise the Amanzimtoti WTP to augment the demands of the SCP-1 over the short to medium term. Water from the SCA Pipeline is expected to be available at the Amanzimoti WTP in ever reducing amounts, until 2020 and augmentation from the Amanzimtoti WTP will thus be limited.
- Implement the South Coast Pipeline Phase 2b project (SCP-2B). SCP-2B includes a pipeline from Scottsburgh South Reservoir to the Park Rynie N2 diamond interchange, a pipeline from Kelso to Malangeni off-take, tie-in to the Umdoni Reservoir and the design and construction of the Mzinto River bridge crossing. This project will further reduce the demand on the Umzinto and Mtwalume WTP's (**Section 11.7.3 (a)**).
- Undertake the following WTP plans (Medium term) once the SCP has been commissioned in its entirety:
    - Decommission the Mtwalume WTP, or continue to supply inland rural communities at the existing yield of the current water resource.
    - Continue to utilise the Umzinto WTP to supply potable water to communities in the adjacent inland areas of Ugu District Municipality. Supply should then be curtailed to the existing yield of the water resource.
- A raw water augmentation scheme, from the Lovu River, is proposed to augment the Amanzimtoti Supply System (**Section 11.7.3(e)**) up to the time that the Lower uMkhomazi Water Supply Scheme (regional option) is constructed (**Section 11.7.3 (c)**).
- Improve the abstraction efficiency at the existing Mtwalume Abstraction Works as a short-term solution. At present the abstraction works can only be used when flow in the Mtwalume River exceeds an estimated flow rate of 0.2 m^3/s.
- Improve the abstraction efficiency at the existing Umzinto Abstraction Works at the Esperanza Weir in the short-term.

Lower South Coast Systems

- Aggressively pursue water loss reduction activities in all supply systems. In addition, quantify the benefits and determine the economic balance between the costs of implementing "loss reduction" against the cost of producing the additional demand and the capex that would have to be implemented to augment existing infrastructure to cater for this "false" demand.
- Improve the abstraction efficiency at the existing St Helen's Rock Abstraction Works during low flow periods. A weir has been proposed by Ugu DM as a short-term solution to prevent the ingress of seawater into the system. Additionally, this weir is a necessary part of the proposed raw water system capacity upgrade, viz. the Ncwabeni OCS Dam project;

- Improve the abstraction efficiency at the existing uMtamvuna Abstraction Works (for low flow periods);
- Assess the feasibility of linking the uMtamvuna System to the uMzimkhulu System between Ramsgate and Southbroom;
- Augment the raw water supply to Harding WTP from the adjacent catchment (Weza River). The proposed emergency scheme should be pursued even though this supply is limited to run-of-river (**Section 11.7.3 (h)**).
- Continue to utilise the Weza WTP to augment the potable water demands of the Harding supply zone over the short to medium term.
- Create additional storage and/or reduce demands at Vulamehlo WTP.

(b) Water Balance (Long Term Plans)

The upper, middle and lower sub regions show a significant risk of failure in the hydrological water balance. Water balance plans include:

Upper and Middle South Coast Systems

- Develop a regional bulk water supply scheme in the Hull Valley area close to Sappi Saiccor. This scheme will receive raw water from an off channel storage dam (Ngwadini Dam) from the Lower uMkhomazi River (Lower uMkhomazi Bulk Water Supply Schemed (BWSS) - **Section 11.7.3(c)**) for treatment and distribution into the SCP. Potable water would be fed northwards to the Upper South Coast region and Amanzimtoti, and southwards to the Middle South Coast region. This would then allow the Amanzimtoti and Craigieburn WTP's to be fully decommissioned.
- Once the full capacity of the Lower uMkhomazi BWSS is utilised, construct a 150 Mℓ/day seawater reverse osmosis (SWRO) desalination plant near the mouth of the Lovu River to link into the SCP.
- Mhlabatshane Phase 2: Construct an abstraction works on the uMzimkhulu River using the existing WTP and associated infrastructure (**Section 11.7.3(b)**). The supply area extends approximately 70 km from the Command Reservoir to KwaMadlala, near Umtentweni. The WTP would be upgraded from 4 Mℓ/day to 8 Mℓ/day.
- Implement the South Coast Pipeline Phase 3 (SCP-3) (**Section 11.7.3 (d)**). This pipeline will tie into the end of SCP-2B and will complete the section between Umdoni and Hibberdene. This project will ultimately link into the Ugu District Municipality supply system from the Bhobhoyi WTP (near Port Shepstone) to add a measure of flexibility and a contingency for drought situations in either system. The timing of SCP-3 is dependent on the development of the Lower uMkhomazi BWSS (**Section 11.7.3 (c)**).
- Upgrade the Quarry Reservoir by an additional 30 Mℓ by 2023. The reservoir upgrade should be constructed in two compartments of 15 Mℓ each.

Lower South Coast Systems

- Further extend the regional bulk water supply scheme from the Lower uMzimkhulu River (Bhobhoyi WTP). The scheme upgrade will receive raw water from a proposed off channel storage dam (Ncwabeni OCS Dam **Section 11.7.3(c)**) for treatment and distribution.
- Evaluate the Camero Estates hydropower plant as a potential energy source for the pumping of water to the Ncwabeni OCS Dam.
- Assess the feasibility of linking the Lower uMzimkhulu Water Resources to both the uMtamvuna and uMkhomazi system in the medium to long term. Potable water could then be fed northwards to Hibberdene and southwards to Southbroom. This would then integrate the main water resources in the South Coast Region. This project would ultimately add a

measure of flexibility and a contingency for drought situations in the entire Lower South Coast System.

- Once the demand at the uMtamvuna WTP increases to the 20 Mℓ/day capacity, extend the raw water abstraction and treatment capacity in 10 Mℓ/day modules (**Section 11.7.3(g)**).
- Construct a dam on the upper uMtwalume River to augment the existing Vulamehlo WTP (**Section 11.7.3(i)**). In addition, the existing abstraction works, WTP and associated infrastructure should be upgraded (4 Mℓ/day to 10 Mℓ/day).
- Investigate the feasibility of constructing an abstraction weir in the Upper uMtamvuna River to augment the raw water supply to both Phase 2 of the Ludeke Dam Supply System and an integrated Weza-Harding Supply System. This would satisfy the long term demand for both supply systems.

Potential development options that have been identified in the South Coast Region are illustrated in **Figure 11.69** and **Figure 11.70**.

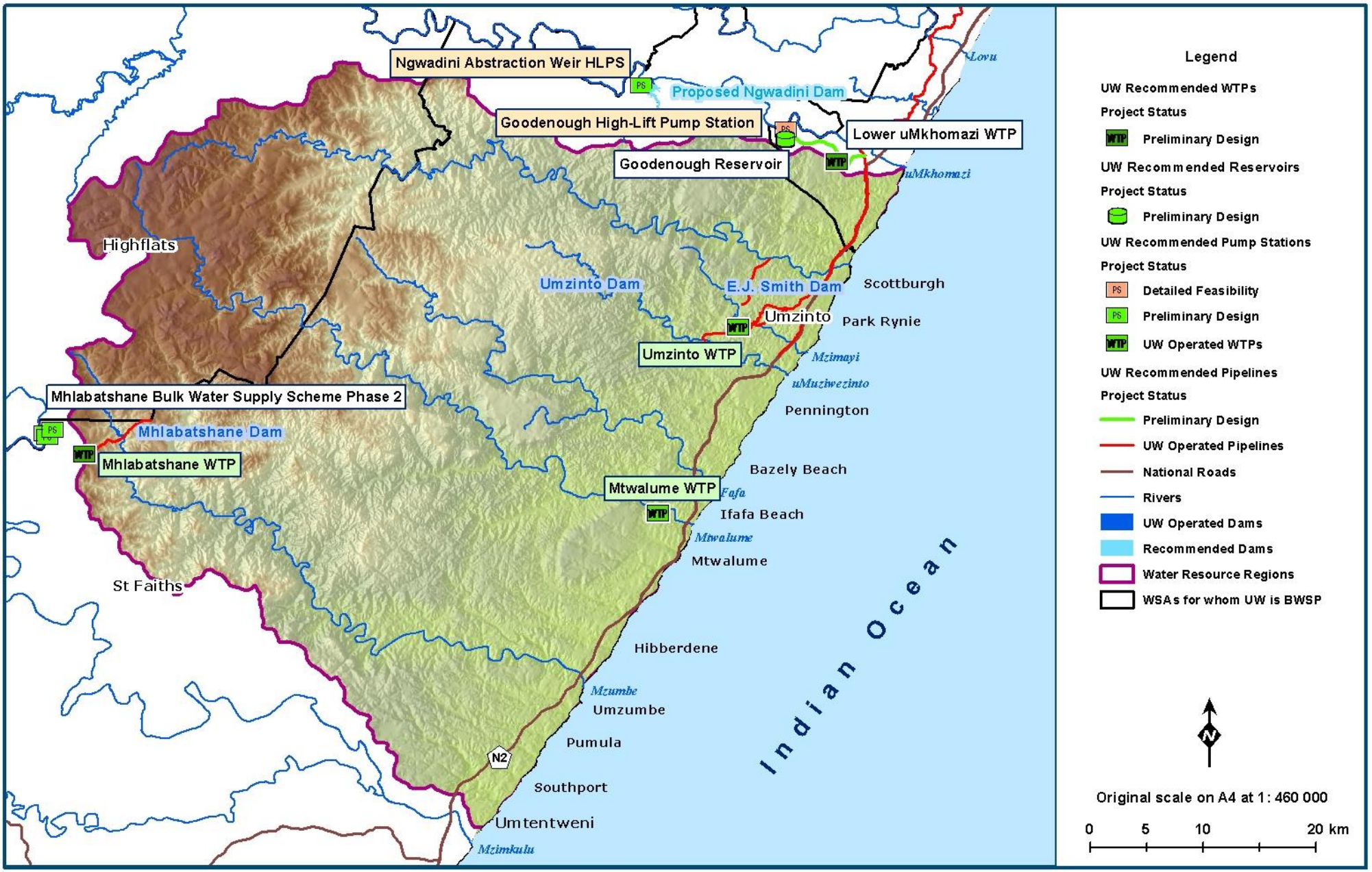


Figure 11.69 Proposed water resource infrastructure in the Middle South Coast Region (KZN DoT 2011; MDB 2016; Umgeni Water 2017; WR2012).

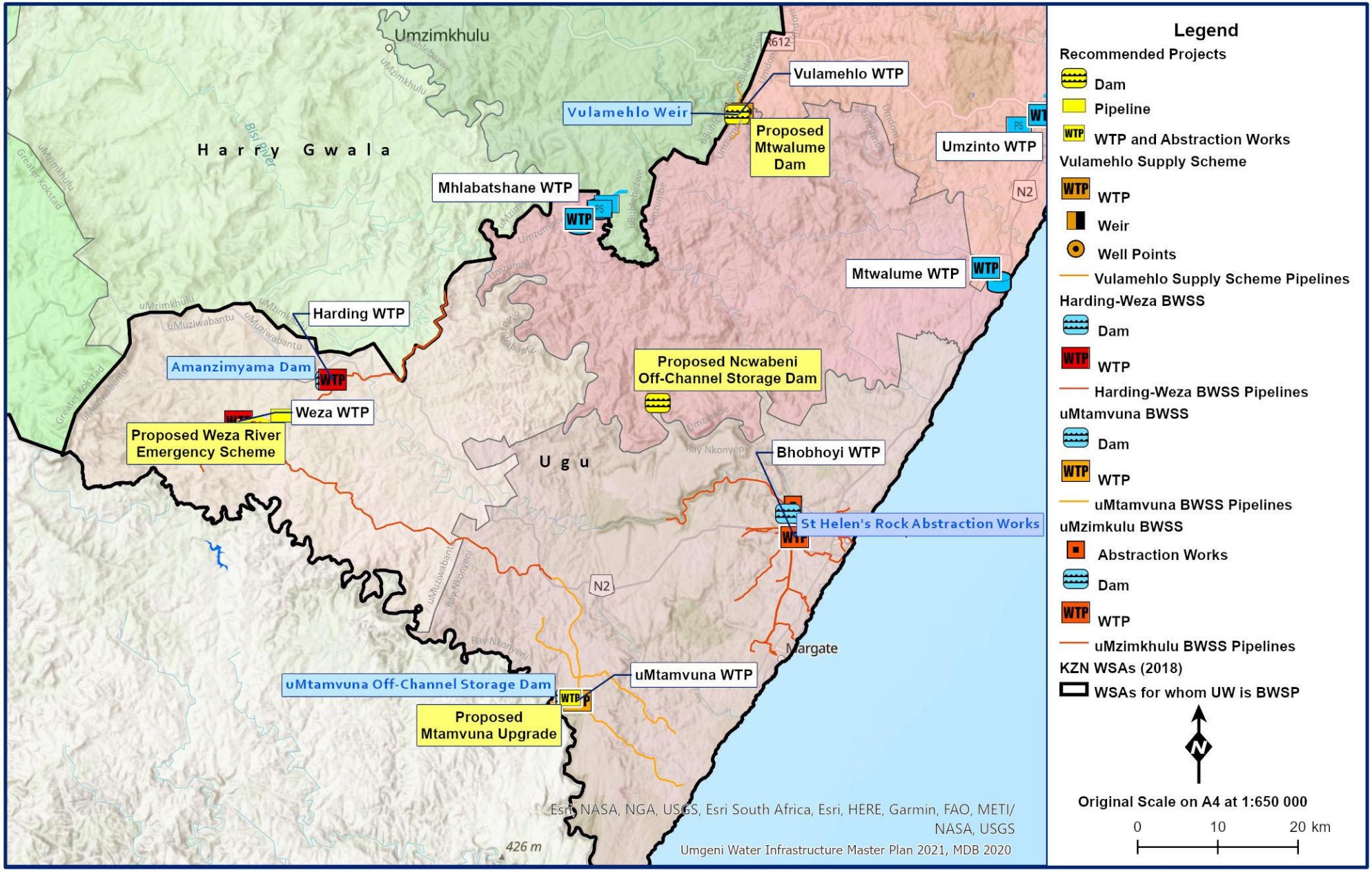


Figure 11.70 Proposed water resource infrastructure in the Lower South Coast Region (KZN DoT 2017; MDB 2016; Umgeni Water 2020; WR2012).

11.7.2 Implementation Strategy

Figure 11.45, Figure 11.46, Figure 11.47, Figure 11.48, Figure 11.49 and **Figure 11.50** depict the system as at October 2020 and the potential for growth in the Upper and Middle South Coast System over the next five, ten, fifteen, twenty and thirty years respectively. Also shown in these figures is the configuration of the system that is planned to supply this demand. The section above provides the details of how each sub system will be affected by the growth in demand over the next thirty years and how the configuration of the system will have to be altered, and projects implemented, to supply the demand.

Similarly, **Figure 11.51, Figure 11.52, Figure 11.53** and **Figure 11.54** depict the system as at October 2020 and **Figure 11.59, Figure 11.60, Figure 11.61** and **Figure 11.62** the potential for growth in the Lower South Coast System over the next five years. Also shown in these figures is the configuration of the system that is planned to supply this demand.

Comparison of the existing system capacities with water demands indicate that the raw water resources are not aligned with the bulk supply and distribution infrastructure. This is evident by the various schemes presented to augment potable water between the main systems. The economics of distributing potable water from a large central WTP versus aligning the various sub systems, by upgrading either the raw water supply or WTP capacities, will have to be determined. It is likely that a hybrid solution will be necessary in order to address the short term issues whilst addressing long term shortfalls.

11.7.3 Projects

(a) South Coast Pipeline 2b – Kelso to Malangeni

Planning No.	305.09
Project No.	CI.00141
Project Status	Construction (Tender awarded October 2020)

(i) Project Description

The South Coast Pipeline (SCP) Project was initiated to extend the supply of water to the South Coast Region. The project is implemented in a phased approach, with Phase 1 and Phase 2a completed.

The South Coast Phase 2b project will consist of four components: -

- Construction of a 2.7 km pipeline from the off-take chamber at Scottburgh South Reservoir (i.e. end point of SCP-1) to the start of the existing Kelso-Pennington pipeline (i.e. SCP-2a).
- Design and construction of a 5.35 km pipeline from Kelso off-take point (i.e. end point of SCP-2a) to a termination point at the inland side of the N2 (i.e. Malangeni off-take), west of the Umdoni Reservoir.
- Design and construction of the Mzinto River bridge crossing (550 m).
- Design and construction of a 635 m tie-in pipeline to Umdoni Reservoir.

- **Kelso to Malangeni Off-take Pipeline**

The South Coast Phase 2b (SCP-2b) route will tie-in to the South Coast Phase 2a pipeline and roughly follows the SANRAL servitude along the N2 south to Umdoni. This pipeline consists of an 800 mm diameter NB steel gravity pipeline with associated chambers and forms two parts extending southwards (**Figure 11.71**). This route includes minor stream crossings and a major bridge crossing over the Mzinto River. The pipeline will connect to the Mzinto River Bridge crossing on both the north and south banks of the bridge abutments. An off-take will be provided for a connection to the Umdoni Reservoir in the vicinity of the Malangeni off-take.

- **Mzinto River Bridge Crossing**

This river crossing is over 550 m long and the valley is approximately 150 m deep at the centre of the bridge. Permission has been obtained from SANRAL to attach the required pipe to the deck of the N2 Umzinto River Bridge. This will provide a considerable saving to the overall project and will minimize any environmental impacts of crossing through the river or of the construction of a new pipe bridge.

- **Off-take to Umdoni Reservoir Pipeline**

The pipeline will be designed and constructed on behalf of Ugu DM. Provision will need to be made for a booster pump station when the SCP is extended further to Hibberdene (i.e. SCP-3).

- **Mnini Pump Station**

To sustain the demand downstream of Quarry Reservoir the level in the reservoir should be maintained between 70% and 90%. This would require two pumps operating during peak times. It is recommended that a third pump be installed at Mnini Pump Station so that a standby pump is available.

Figure 11.71 General layout of the proposed South Coast Pipeline Phase 2b.

The remainder of the South Coast Pipeline will ultimately be extended from Malangeni off-take (Umdoni) to Hibberdene once the Lower uMkhomazi Bulk Water Scheme is in place (**Section 11.7.3 (c)**). The Lower uMkhomazi scheme will provide an assured supply of water to the area without being reliant on the Lower Mgeni System.

Key information on this project is summarised in **Table 11.54**.

Table 11.54 Project information: South Coast Pipeline Phase 2b.

Project Components:	• Section 1 – 2.7 km, 800 mm nominal diameter steel pipeline (7.8 mm wall thickness) including all ancillary works. • Section 2a - 4.96 km, 800 mm nominal diameter steel pipeline (7.8 mm wall thickness) including all ancillary works. • Section 2b – Umzinto River bridge crossing – 390 m 800 nominal diameter steel pipeline (9.3 mm wall thickness to provide an additional factor of safety thereby reducing the likelihood of pipeline failure on this section of pipeline)
Capacity:	37.5 Mℓ/day (8.34 Mℓ/day Umdoni Reservoir tie-in)

(ii) Institutional Arrangements

The bulk supply infrastructure of the Kelso to Malangeni link will be owned, operated and maintained by Umgeni Water, who will sell potable water from this system to Ugu District Municipality as per the Bulk Water Supply Agreement.

(iii) Beneficiaries

The construction of the South Coast Phase 2b pipelines will alleviate the pressure on the Umzinto and the Mtwalume water treatment plants and supply system by supplying potable water directly to communities within the Umdoni Municipality. Assuming 200 ℓ/person/day, the estimated number of beneficiaries from the anticipated capacity of 37.5 Mℓ/day may be 187 500 people.

(iv) Implementation

The detailed design of this project was completed in September 2016. The construction period is estimated at 52 weeks. Pipe was supplied to site in May 2018. The construction tender was awarded during October 2020 and the project commenced in November 2020. However, site establishment has not yet been achieved due to various unresolved issues with Interested and Affected Parties.

(b) Mhlabatshane Bulk Water Supply Scheme Phase 2

Planning No.	305.5
Project No.	CI.00155
Project Status	Detailed Design (Tender awarded May 2019)

(i) Project Description

Umgeni Water implemented Phase 1 of the Mhlabatshane Bulk Water Supply Scheme (**Section 11.3.3 (a)**) as part of a larger regional scheme development by Ugu District Municipality, aimed at reducing water services backlogs in certain rural areas in the Umzumbe and Ray Nkonyeni Local Municipalities. This scheme extends from Phungashe, within the Nhlangwini Tribal Authority in the north, to Assisi Mission, within the Shabeni Tribal Authority, in the south. It falls mainly within the Umzumbe Local Municipality, is bounded by Harry Gwala District Municipality in the north, the Mzimkulu River in the west and south, the Umzumbe River in the east, and the Shabeni and KwaMadlala areas of the Ray Nkonyeni Local Municipality in the south.

Water demands from this scheme exceed the assured yield of the Mhlabatshane Dam, and there is a need to develop the second phase of the project see **Figure 11.72** and **Figure 11.73**. Water will be abstracted directly from the Mzimkhulu River, pumped to the WTP (which will need to be upgraded from 4 Mℓ/day to 8 Mℓ/day) and then fed into the reticulation system via a command reservoir. Key project information is summarised in **Table 11.55**.

Table 11.55 Project information: Mhlabatshane BWSS Phase 2.

Project Components:	• Abstraction weir and abstraction works on the Mzimkulu River, with de-silting mechanism. • Raw water pump station and associated electrical and mechanical works. • Raw water rising main. • Raw water intermediate/booster pump stations and associated electrical and mechanical works. • Balancing tanks / reservoirs. • The existing 4 Mℓ/day water treatment works is to be upgraded to an 8Mℓ/day plant, which includes a clear-water pump station • Command Reservoir increase from 2 Mℓ to 4 Mℓ in storage capacity
Capacity:	8 Mℓ/day in total

(ii) Institutional Arrangements

Umgeni Water will own, operate and maintain the bulk water supply components of the Scheme. Ugu District Municipality will own, operate and maintain all reticulation components of the Scheme.

(iii) Beneficiaries

Phase 1 serves approximately 67,000 people and it is anticipated Phase 2 will serve 100,000 people in total.

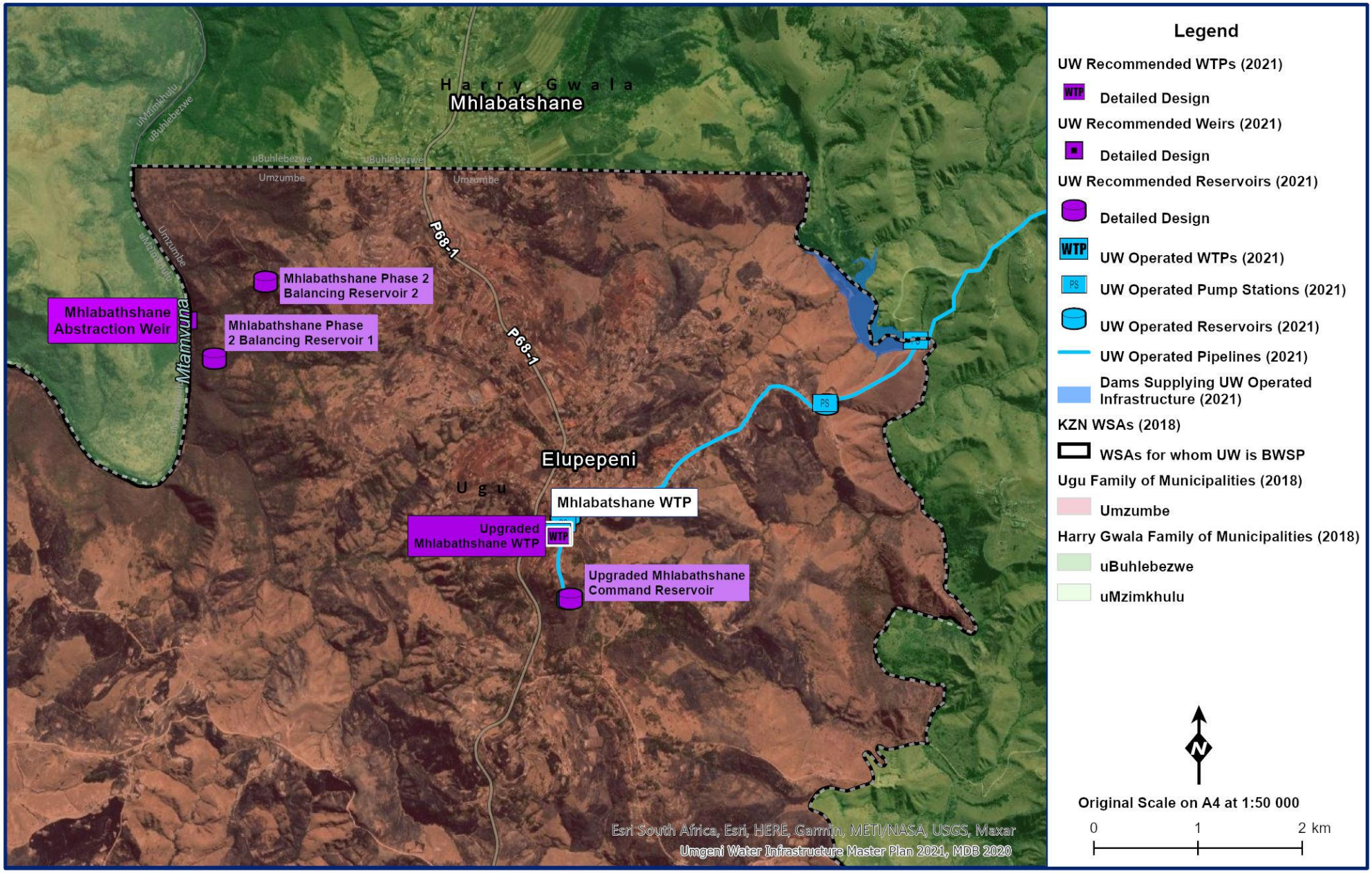


Figure 11.72 General layout of the Mhlabatshane BWSS Phase 2.

(iv) Implementation

The total estimated capital cost for Phase 2 is R950 million (2020 base year costs). The detailed feasibility and preliminary design stage of the project was completed in 2016. The project is currently in the detailed design stage; with an anticipated commissioning date of 2028.

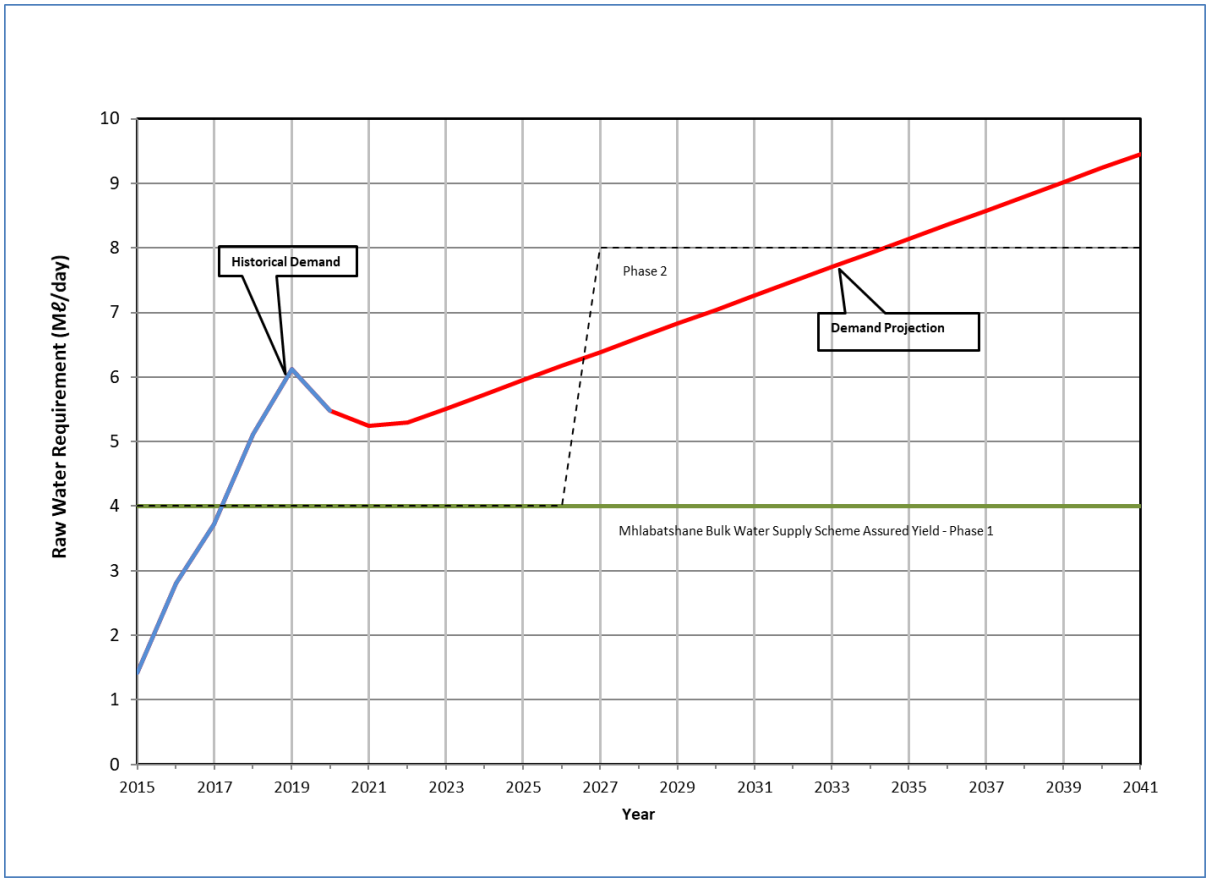


Figure 11.73 Water Balance Mhlabatshane BWSS.

(c) Lower uMkhomazi Bulk Water Supply Scheme

Planning No.	305.7
Project No.	CI.00156
Project Status	Detailed Design (Tender awarded March 2018)

(i) Project Description

The Upper and Middle South Coast required augmentation after 2017 when the water requirement exceeded existing bulk water infrastructure and local resources (**Figure 11.74**). This proposed scheme is thus a critical solution to securing water supply for the South Coast Region.

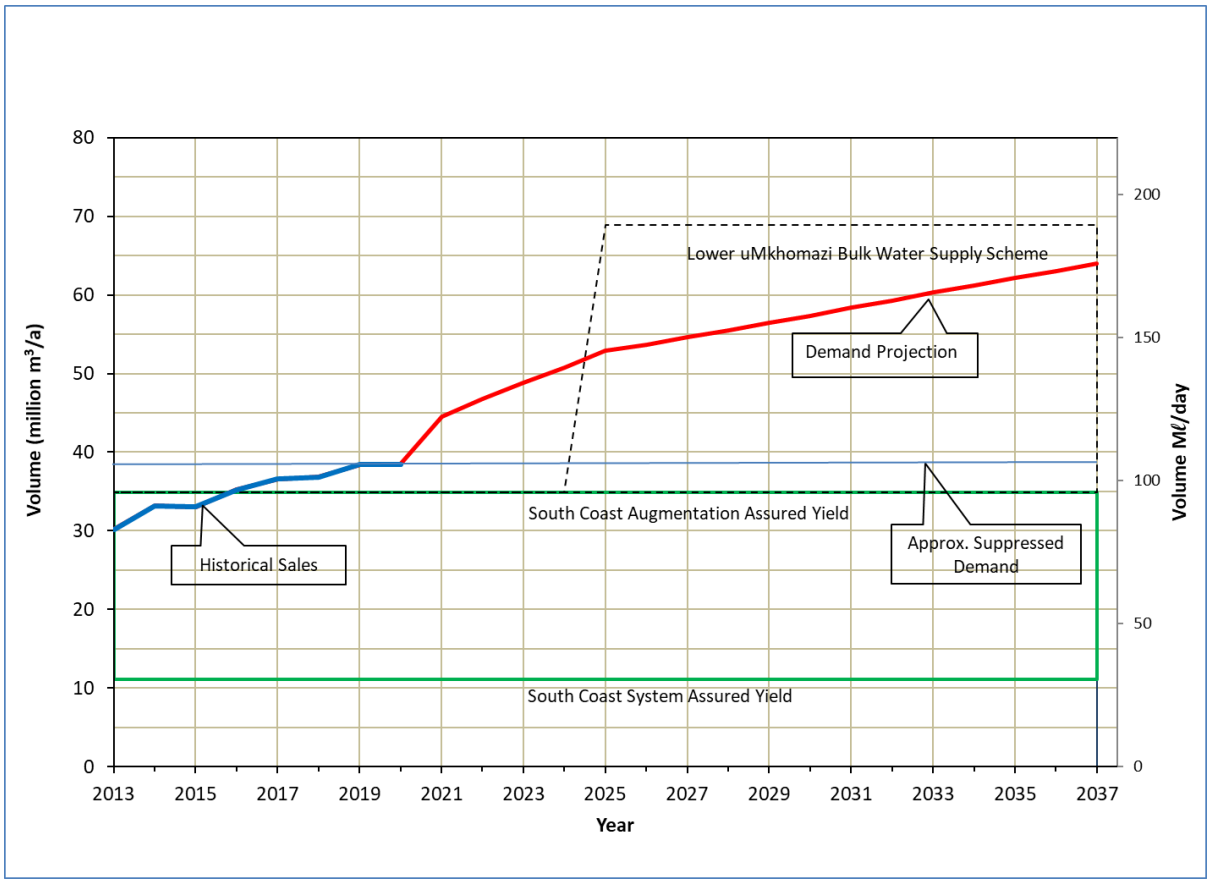


Figure 11.74 Water Balance Upper and Middle South Coast.

An investigation at a detailed feasibility level and preliminary design was completed during 2016. The optimum configuration, sizing, phasing and costing of all infrastructures required for the proposed Lower uMkhomazi Bulk Water Supply Scheme (BWSS) have been determined (**Figure 11.75**).

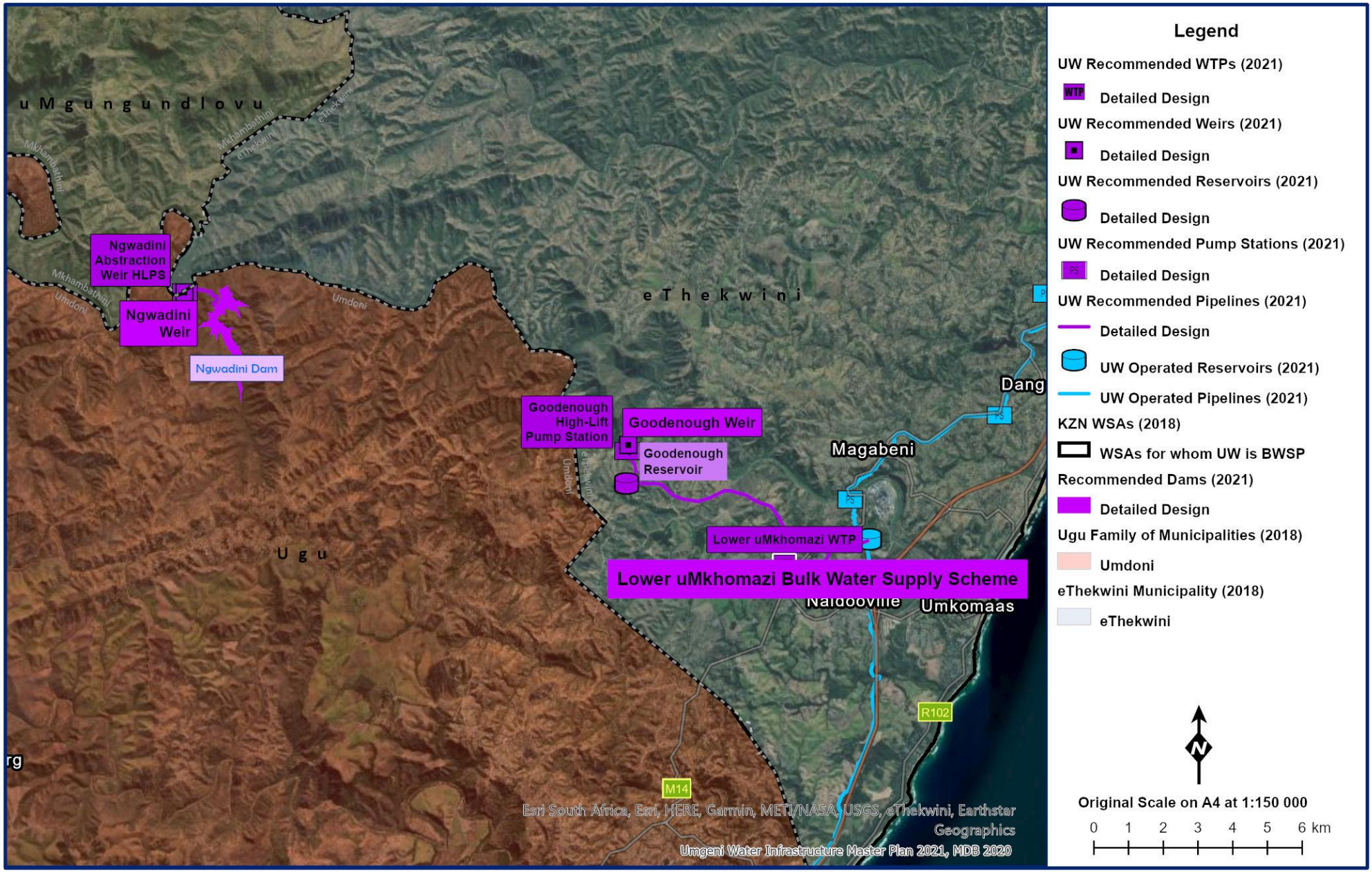


Figure 11.75 Layout of the proposed Lower uMkhomazi BWSS.

The project (**Figure 11.75**) comprises of two abstraction weirs and works, Ngwadini Off-Channel Storage (OCS) dam and related water treatment and conveyance infrastructure located within the Lower uMkhomazi River catchment. The water supply scheme will be used to supply an estimated future AADD of 100 Mℓ/day to the Upper and Middle South Coast. In the high flow summer months, raw water will be abstracted from the uMkhomazi River and stored in a 10 million m^3 OCS dam, for usage during the dry winter months. During summer the WTP will be supplied with raw water abstracted directly from the river at Goodenough.

In winter, water will be released back into the uMkhomazi River and abstracted at the downstream Goodenough weir. Raw water will be pumped from this weir to a 6 hour raw water storage reservoir, and then gravity fed to the WTP. The Quarry Reservoir has been identified as the tie-in point to the South Coast Pipeline; all treated water from the WTP will be stored and distributed from this reservoir. All infrastructures will be designed to handle daily, as well as seasonal variations and peaks.

Key information on this project is summarised in **Table 11.56**.

Table 11.56 Project components and AADD capacity for the Lower uMkhomazi BWSS.

Project Components:	• Ngwadini Weir (2.5 m high), abstraction and low lift pump station for the OCS dam located on the uMkomazi River. • Hydrocyclones desilting mechanism (0.75 m^3/s). • Pressurised pipeline to OCS dam (0.75 m^3/s). • Ngwadini OCS Dam (10.5 million m^3/annum) located adjacent to the uMkomazi River. • Goodenough Weir (raised from 3 to 3.35 m high), abstraction and low lift pump station for the WTW located on the uMkomazi River. • Hydrocyclones desilting mechanism (1.3 m^3/s). • High lift pump station (1.3 m^3/s). • Pressurised pipeline to Goodenough Reservoir (6 hours). • Gravity pipeline to WTP (1.2 m^3/s). • WTP (100 Mℓ/day). • Gravity pipeline to Quarry Reservoir (1.2 m^3/s). • Electrical sub-station (132 kV/22 kV), transmission and conveyance infrastructure. • A solution to deliver water at the lowest possible overall cost, and with the least environmental impact to the South Coast area.
Capacity:	100 Mℓ/day.

(ii) Institutional Arrangements

The new infrastructure will be operated and maintained by Umgeni Water and will be part of the Bulk Supply agreement with the relevant stakeholders.

(iii) Beneficiaries

This scheme will benefit the residents of the Upper and Middle South Coast regions. Assuming 200 ℓ/person/day, the estimated number of beneficiaries from the anticipated capacity of 100 Mℓ/day may be 500 000 people.

(iv) Implementation

The infrastructure is required by 2020 to meet the increasing demands within the supply area. The total cost is estimated to be R 4.92 billion (2021 base year costs).

Power supply to site has been flagged as a risk that could cause unnecessary project delays and to mitigate this Umgeni Water will have to facilitate the upgrades of regional networks. The associated contributions towards the electrical conveyance infrastructure have been included in the scheme cost.

The implementation programme critical path is the construction of Ngwadini Dam. However, the nature of the project offers flexibility and can deliver water, albeit with a 10% risk of non-supply, once the Goodenough abstraction weir and works, conveyance infrastructure, and the WTP are constructed. To enable this earlier delivery of water, related components of infrastructure have been grouped into practical implementation packages.

Tenders for the detailed design component of this project were awarded in March 2018. The detailed design is expected to be completed by April 2021. The construction is anticipated to commence in 2021.

(d) South Coast Pipeline Ph 3 - uMdoni to Hibberdene

Planning No.	305.15
Project No.	CI.00142
Project Status	Detailed Feasibility, Preliminary Design and Detailed Design (Framework Agreement tender to be awarded Mid-2021)

In 2003 Umgeni Water planned the supply of potable water to the South Coast Region via a single bulk water pipeline. This would allow many of the smaller water treatment plants in the region to be decommissioned but would also provide a sustainable source of water to the area. Potable water could then be supplied up or down the coastal zone from as far north as Amanzimtoti to as far south as Hibberdene. This pipeline, known as the South Coast Pipeline (SCP), was planned to supply the following six main sub-regions:

- Amanzimtoti WTP supply area (SCP-1)
- Umbumbulu WTP supply area (SCP-1)
- Mfume WTP supply area (SCP-1)
- Craigieburn WTP supply area (SCP-1)
- Umzinto WTP supply area (SCP-1&2)
- Mtwalume WTP supply area (SCP-3)

The SCP-1 was completed in 2007 and an extension to this pipeline from Scottburgh to Park Rynie (SCP-2a) in 2009. The SCP-2b, which will further extend this pipeline from Park Rynie to Umdoni, is currently in tender for construction. The SCP-3 will extend the South Coast Pipeline further from Umdoni to Mtwalume and then to Hibberdene. The timing of SCP-3 relies on the commissioning of the Lower uMkhomazi Bulk Water Scheme (**Section 11.7.3 (c)**).

(i) Project Description

Umgeni Water investigations to date have been at a pre-feasibility level. **Figure 11.76** illustrates the conceptual level investigation of the planned future bulk supply system from Quarry Reservoir to Catalina Reservoir. The supply catered for a 30 year demand horizon, assuming a 10 Mℓ/day supply to Hibberdene. The existing 600 mm diameter pipelines (Phase 2) are not sufficiently sized to cater for the 30 year design demand. Upgrades to these pipelines are within the scope of this project and are likely to be required within the next 10 to 15 years although this will be dependent on the actual growth in demand that takes place over this period. It is likely that additional pipelines, laid in parallel with the existing pipeline, will be the most cost-effective means of providing these upgrades. In addition, the proposed project involves the provision of booster pump stations and reservoirs to link the areas either side of the pipeline route.

The current objective of this study is to carry out a Detailed Feasibility Study and Preliminary Design, then Detailed Design for the SCP-3 with an indication of potential upgrades that may be needed to the existing pipelines. Bulk supply pipelines, reservoirs, pump stations and river crossings will have to be considered during this study. The SCP will finally integrate with the Bhobhoyi WTP (near Port Shepstone) in the vicinity of Hibberdene and this will mean that there will, effectively, be a single water conduit from Amanzimtoti all the way to Port Shepstone. The integration of the two schemes will provide a measure of operational flexibility and this will provide a contingency in the event of drought situations in either system.

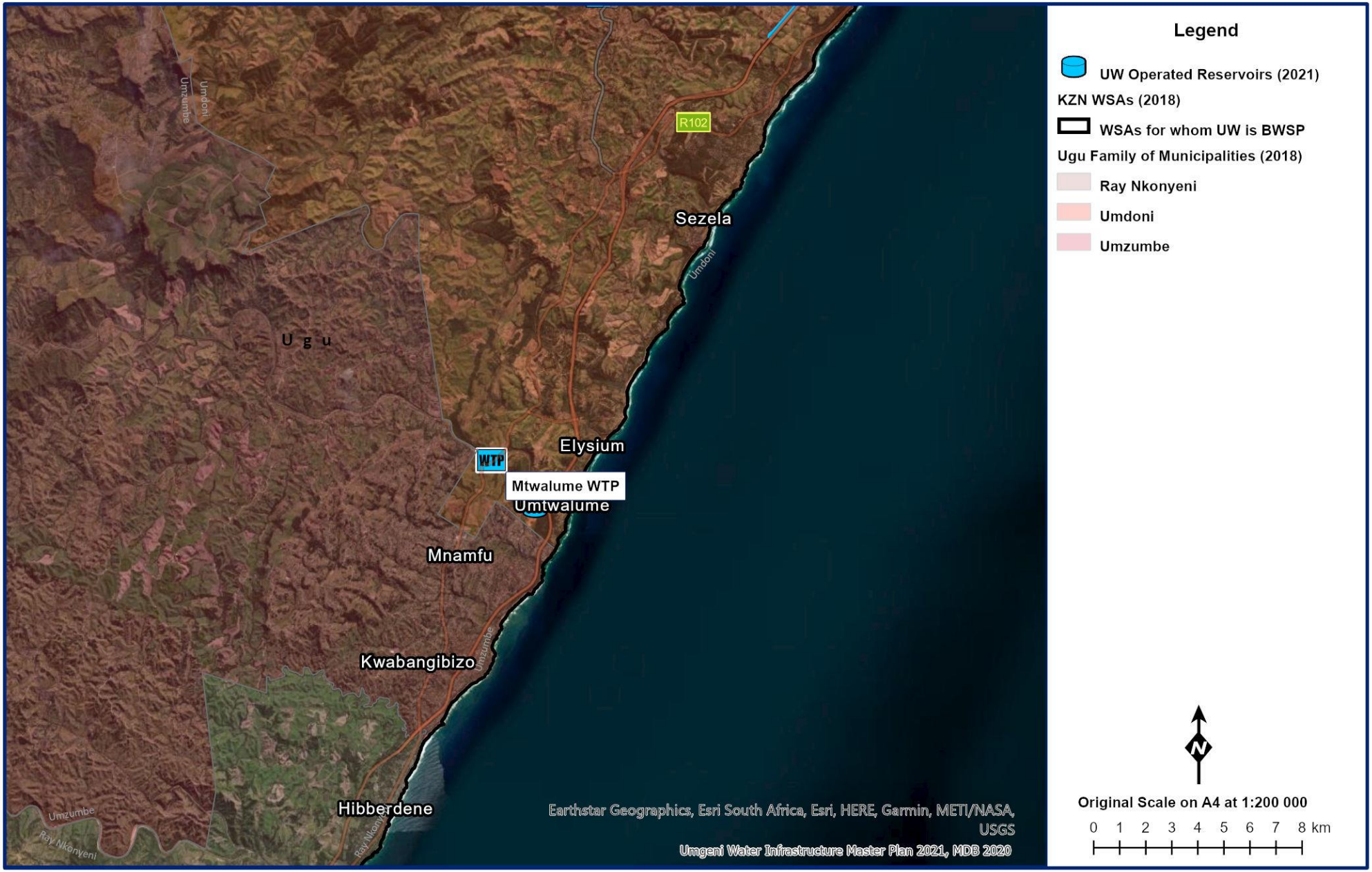


Figure 11.76 Proposed South Coast Pipeline Phase 3.

(ii) Institutional Arrangements

The SCP-3 is situated in Ugu District Municipality (DM). Umgeni Water will sell potable water from this system to the Ugu DM, as per existing bulk water supply agreements.

(iii) Beneficiaries

This project will provide water to both the Umdoni and Umzumbe Local Municipalities within the Ugu District Municipality and is planned to supplement the potable water supply produced by the Mtwalume WTP. This will provide potable water access for over 60 000 inhabitants in Bazley, Elysium, Ifafa and uMtwalume along the coast and inland rural areas of Mathulini and kwaQologolo.

(iv) Implementation

The infrastructure is already required to meet the demands within the supply area. The rough estimated cost of the entire project is approximately R 505 million at 2018 base year costs. The anticipated implementation programme is as follows: Feasibility and Detailed Design completed by December 2024 ready for construction. Should the project proceed to construction, the anticipated commissioning date would be June 2027 (Phase 3a) and June 2032 (Phase 3b).

(e) Raw Water Augmentation to the Amanzimtoti Supply System from the Lovu River

Planning No.	n/a
Project No.	CI.00383
Project Status	Turnkey (Tender awarded May 2020)

Amanzimtoti is supplied with water from two sources. Raw water (capacity 20 Mℓ/d) is supplied from Nungwane Dam and treated at Amanzimtoti Water Treatment Plant (WTP) and the South Coast Augmentation Pipeline can supply a maximum capacity of 75 Mℓ/d of potable water from the Wiggins WTP to Amanzimtoti WTP. The growth in demand along the South Coast means that the total demand on the system is likely to exceed the supply capacity at this point before the Lower uMkhomazi Water Project is constructed. An, interim, augmentation scheme could supply an additional 8 Mℓ/d raw water from the Lovu River to the Amanzimtoti WTP to mitigate the potential need for restrictions as demand increases.

(i) Project Description

Figure 11.77 illustrates the conceptual level layout of the proposed raw water augmentation to the Amanzimtoti WTP from the Lovu River. The proposed scheme is summarised as follows:

- Abstraction facility, located in the river downstream of a steel girder bridge crossing the provincial road P197-3, across the Lovu River.
- High lift pump, capable of pumping 8 Mℓ/day.
- Construction of a raw water rising main from the abstraction facility, adjacent to the Lovu River, to the Amanzimtoti WTP head-of-works (clarifiers). This 7 500 m pipeline comprises of 1 000 m of 350mm diameter steel and 6 500 m of 315mm diameter uPvc-O pipe, including associated accessories (both pipe materials and diameters are immediately available).
- Temporary power supply (generator and associated accessories if needed).
- Power supply of approximately 350 kW from Eskom including connection fee, 800 kVA transformer, switch gear, 500 m of medium volt cable and installation (to alleviate monthly pumping operating costs).
- The pipeline route would follow the Umgeni Water South Coast Pipeline route from the Lovu River to a discharge point at the WTP.

Figure 11.77 Layout of proposed raw water augmentation to the Amanzimtoti Supply System from the Lovu River.

(ii) Institutional Arrangements

The proposed Lovu River abstraction point and Amanzimtoti WTP is situated in eThekweni Metro. Umgeni Water will operate and maintain the raw water scheme and will sell potable water from this system as per the existing bulk water supply agreements.

(iii) Beneficiaries

This project will augment the supply of water to both the Ugu District Municipality and eThekwini Metro. It is planned to augment the raw water supply into the Amanzimtoti WTP. Potable water will then be supplied from the plant to the Amanzimtoti, Kwamakhuta, Mfume, Magabeni, Mnini and Umkomaas regions of eThekwini Metro; as well as the Middle South Coast Region currently supplied by the Umzinto WTP.

(iv) Implementation

The infrastructure is already required to meet the demands within the supply area. The estimated cost of the entire project is approximately R 53.5 million at 2020 base year costs. The project should proceed to construction, with the anticipated commissioning date during November 2021.

(f) Ncwabeni OCS Dam

Planning No.	305.11
Project No.	
Project Status	Feasibility Study (Completed 2012 by the then DWA)

(i) Project Description

The uMzimkhulu Regional Water Supply Scheme reached capacity in 2010 when the water requirement exceeded existing bulk water infrastructure and local resources (**Figure 11.78**). The Ncwabeni OCS Dam is a solution to securing water supply for the Lower South Coast Region.

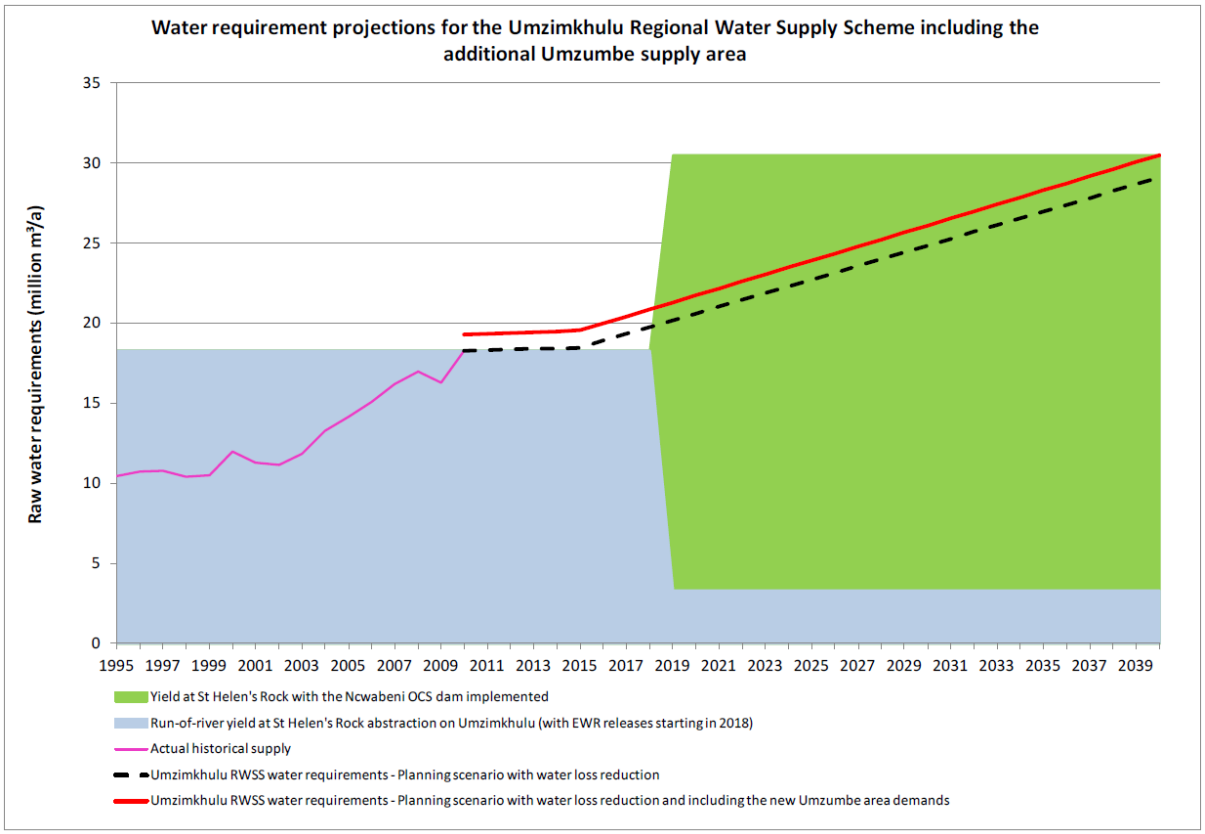


Figure 11.78 Water Balance Lower South Coast.

An investigation at a detailed feasibility level was completed by the then Department of Water Affairs in 2012. The optimum configuration, sizing, phasing and costing of all infrastructures required for the proposed Ncwabeni Off-Channel Storage (OCS) Dam have thus been determined (**Figure 11.79**).

Key information on this project is summarised in **Table 11.57.**

Table 11.57 Project information: Ncwabeni Off-Channel Storage (OCS) Dam.

Project Components:	• Ncwabeni Weir (2.75 m high), abstraction and low lift pump station for the OCS dam located on the uMzimkhulu River. • Pressurised pipeline to OCS dam (0.75 m^3/s). • Ncwabeni OCS Dam (15.7 million m^3/annum) located adjacent to the uMzimkhulu River.
Capacity:	1:100 year yield (99% Assurance of Supply) 80 Mℓ/day (incl run-of-river at St Helen's Rock)

(ii) Institutional Arrangements

The funding and institutional options are interlinked. Umgeni Water has expressed interest in being the institution responsible for funding and implementing the OCS dam providing that Ugu DM appoint UW as the bulk water services provider for the uMzimkhulu RWSS. If this were the case then the OCS dam would be owned, operated and maintained by UW and the Bhobhoyi WTP operated by UW. Alternatively, either DWS or Ugu DM would have to raise funds for the project and then implement and operate the scheme.

(iii) Beneficiaries

The inclusion of the Ncwabeni OCS Dam would significantly increase the assurance of supply for the uMzimkhulu RWSS in the long term and will benefit the residents of the Lower South Coast regions. Assuming 200 ℓ/person/day, the estimated number of beneficiaries from the anticipated raw water supply scheme (with a capacity of 80 Mℓ/day) would be approximately 400 000 people.

(iv) Implementation

The project detailed feasibility study was completed in 2012. A design development and detailed design would be required prior to commencement of construction activities. This is likely to take two (2) years. The anticipated construction programme illustrates four (4) years duration for delivery of water (original planned completion date was 2018). The total cost is estimated to be R 900 million (base year 2017) for the Ncwabeni OCS Dam and abstraction works. This would exclude any upgrades to the Bhobhoyi WTP and distribution pipelines.

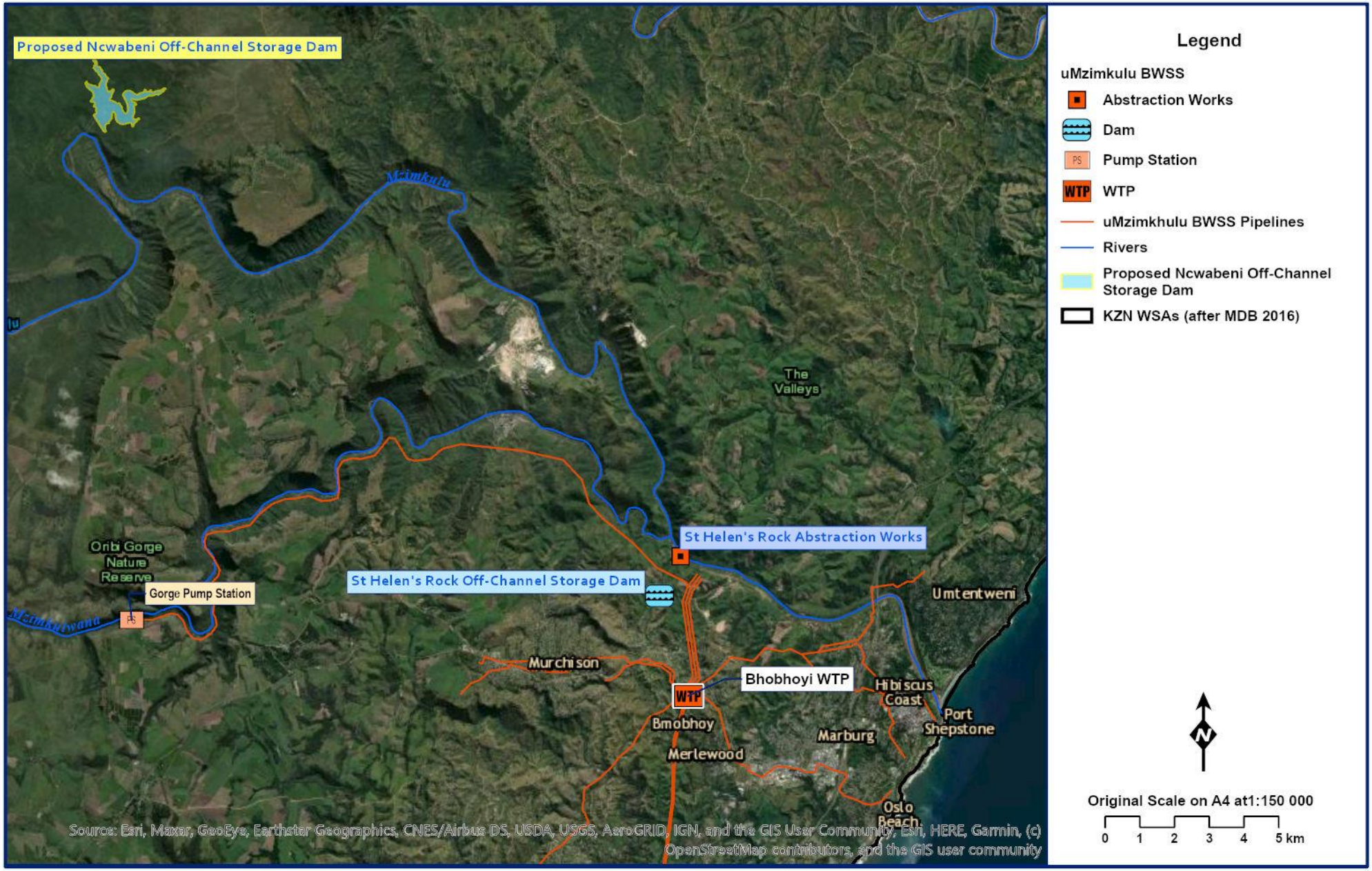


Figure 11.79 General layout of the Ncwabeni OCS Dam and Abstraction Work.

(g) uMtamvuna WTP and Raw Water Abstraction Upgrade

Planning No.	
Project No.	
Project Status	

(i) Project Description

Previous investigations aimed at finding a solution for supplying the entire South Coast highlighted the need to investigate local resources in more detail. In addition to this recommendation, it was recognised that the abstraction works on the uMtamvuna River should be upgraded. Based on available information, the uMtamvuna Catchment has a surplus water supply capacity of 5 million m^3/annum. The uMtamvuna Water Supply System comprises the following:

- raw water abstraction from the uMtamvuna River
- 180 Mℓ balancing off-channel storage (OCS) Dam adjacent to the river,
- 20 Mℓ/day Water Treatment Plant (WTP), and
- Bulk service storage infrastructure and associated distribution network.

The WTP and run-of-river abstraction facilities have been designed for a capacity increase from 20 Mℓ/day to 30 Mℓ/day. The upgrades are adequate to meet the projected 2045 demand. The estimated cost of the project would be R200m (2016 base cost).

(h) Raw Water Augmentation To The Harding Supply System From the Weza River - Emergency Scheme

Planning No.	305.17
Project No.	CI.00397
Project Status	Construction (Tender to be awarded April 2020)

(i) Project Description

Umgeni Water (UW) is the Bulk Water Service Provider for Ugu District Municipality (Ugu DM). UW currently only operates in the Upper and Middle South Coast sub-systems, supplying bulk treated water to the northern parts of the Ugu DM although an agreement is being concluded to extend this supply to Harding.

Ugu DM have confirmed that the Amanzimnyama Dam, which is used to supply Harding, has been below the dead storage level for at least the past 12 months and that the town is now supplied, albeit in limited volumes, via the Weza Water Supply Scheme. Following numerous public protests Ugu DM, the Department of Water and Sanitation and CoGTA approached UW to investigate and obtain a solution to this water supply crisis.

UW has identified an option to augmenting supply to the Amanzimnyama Dam (the raw water resource for the Harding WTP) via a 6 km pipeline from the Weza River. This option was presented to Ugu DM and resulted in a signed agreement between the municipality and UW to develop the scheme without delay (**Figure 11.80**).

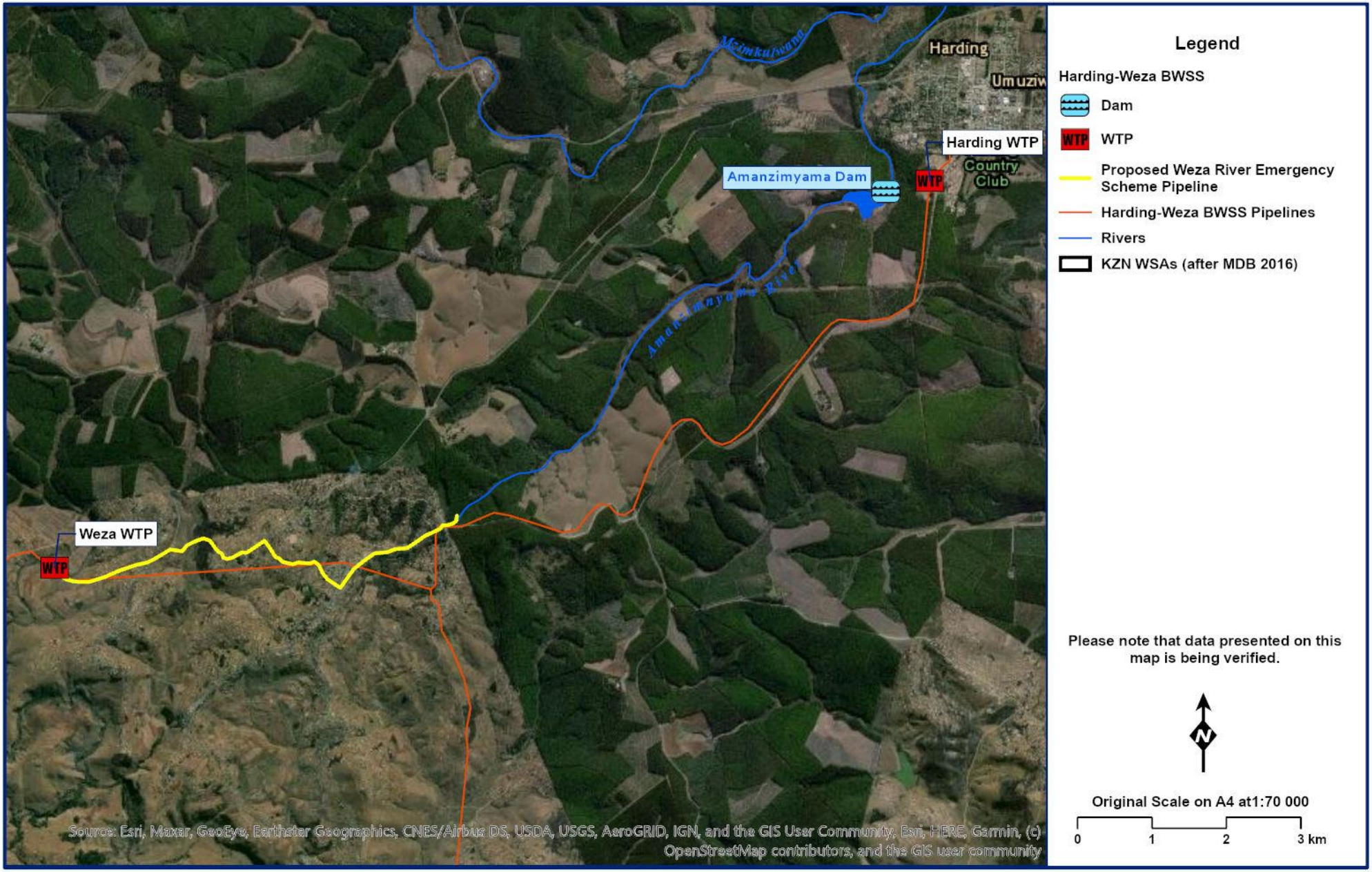


Figure 11.80 General layout of the Weza River Emergency Scheme.

Water would be abstracted directly from the Weza River near the District Road (D862) River Crossing and discharged into a dissipation structure located at the head of the Amanzimnyama (Harding) Dam catchment (adjacent to the Provincial Road P238). The raw water transfer volume would be 8 Mℓ/day. Key project information is summarised in **Table 11.58**.

Table 11.58 Project information: Weza River Emergency Scheme.

Project Components:	• Temporary abstraction facility from the Weza River (at existing Weza WTP abstraction site). • Temporary raw water pump station and associated electrical and mechanical works (incl. primer tank between low lift and high lift pumps). • Temporary power supply (i.e. generator with related electronics) • Raw water rising main, approximately 6km. • Energy Dissipation structure
Capacity:	8 Mℓ/day in total

(ii) Institutional Arrangements

Umgeni Water will own, operate and maintain the emergency scheme.

(iii) Beneficiaries

The Amanzimnyama (Harding) Dam serves approximately 10,000 people.

(iv) Implementation

The total estimated capital cost for the emergency scheme is R50 million (2019 base year costs). The project is currently in the tender stage; with an anticipated construction and initial operating period of 6 months from Tender award.

(i) Vulamehlo Dam and WTP Upgrade

Planning No.	
Project No.	
Project Status	Prefeasibility (completed 2014)

(i) Project Description

The Vulamehlo Area has a water supply deficit as the available water is not sufficient to meet the current water requirements. This has resulted in an estimated suppressed demand of 10 Mℓ/day. The existing 3.0 Mℓ/day WTP is supplied via a run-of-river abstraction facility although this is not adequate to meet current demand. To augment the existing resourcs, a dam could be constructed upstream of the existing abstraction wier (on the uMtwalume River) and this, together with an upgrade to the raw water pipeline would be sufficent to meet the 30 year demand. The estimated cost of this upgrade (in 2014) was R170m.

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Verbal Communication JOAT 2021

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- Sandile Sithole (Hydrologist) Water resources of all systems excluding the North Coast, South Coast and Upper uThukela Systems
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