REFINEMENT OF STRATEGIC GROUNDWATER SOURCE AREAS OF SOUTH AFRICA

Project Stakeholder Committee Meeting 02

Presented by: Umvoto
Date: 18 February 2025

WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

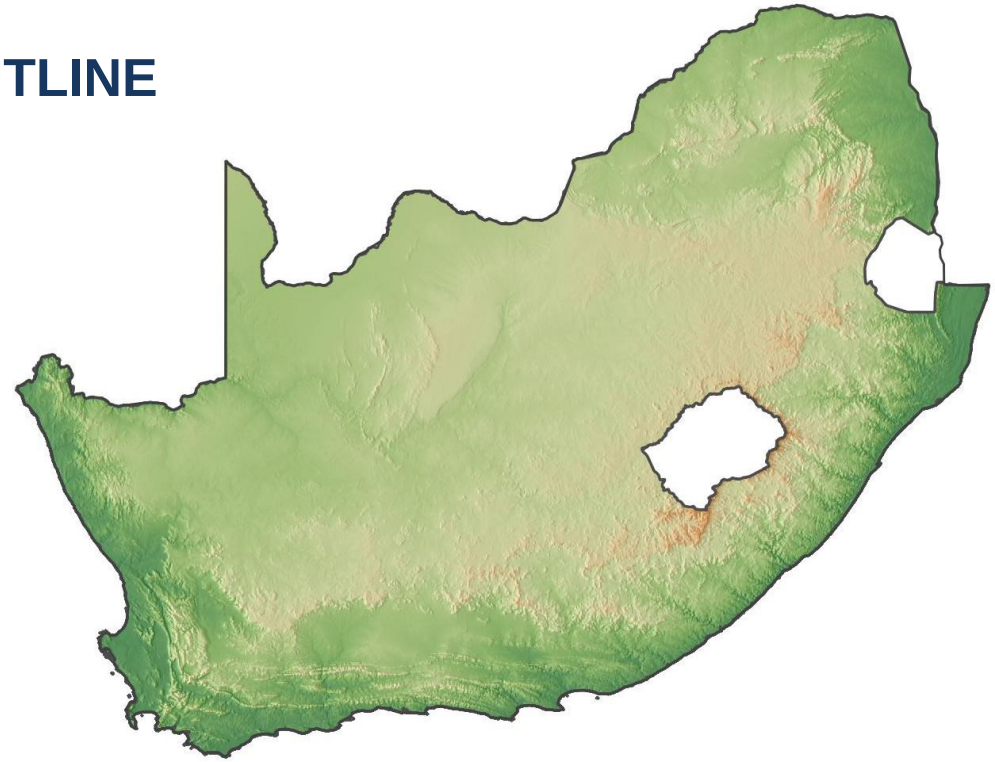
30 YEARS OF FREEDOM
South Africa 1994 - 2024

UMVOTO

EARTH | WATER | SCIENCE | LIFE

PRESENTATION OUTLINE

1. Quick Recap
2. Progress to Date
3. Status Quo Report
    1. Example SWSA-gw
4. Upcoming Events
    1. Meetings
    2. Stakeholder Engagement
    3. Capacity Building
5. Finance Overview
6. Discussion



PROJECT OVERVIEW

Initiation

- **Initiated by:** DWS Chief Directorate: Water Ecosystems Management (CD: WEM).
- **PSP:** Umvoto South Africa (Pty) Ltd.

Project Focus

- **Focus:** Refine South Africa's Strategic Groundwater Source Areas (SWSA-gw)
- **Goal:** Improve the spatial accuracy SWSA-gw for South Africa and refine delineations to be aquifer-specific (where feasible).
- **Purpose:** Guide management and protective measures.

Implementation

- **Approach:** To facilitate collaboration among government and non-government stakeholders.
- **Framework:** Integrated Water Resource Management (IWRM) as per the National Water Act (NWA; Act No. 36 of 1998) and National Water Recourse Strategy III (NWRS III, 2023).

PROJECT PHASES & PROGRESS TO DATE

Phase 0: Project Management, Administration, Communication and Capacity Building			Progress
P0	**P0.1** General Project Management		ONGOING
	P0.2 PMC Meetings		
	P0.3 PSC Meetings		
	P0.4 PS Meetings		
	P0.5 Ad Hoc Meetings		
	P0.6 Monthly Progress Reports		
	P0.7 Capacity Building		
Phase 1: Project Inception			
P1	**D1.1**: Inception Report	**T1.1.1**: Lit Review	COMPLETE
Phase 2: Information and Data Gathering			
P2	**D2.1**: Gap Analysis Report	**T2.1.1**: Data and Information Assessment **T2.2.1**: Inventory of Water Resource Tools	COMPLETE
Phase 3: Refinement of SWSA-gw			
P3	**D3.1:** Status Quo SWSA Report	**T3.1.1**: Status Quo SWSA Assessment	IN PROGRESS
	D3.2: Refined Methodology Report	**T3.2.1**: Refined Methodology Assessment	NOT STARTED
	D3.3: Delineation of Refined SWSA-gw Report	**T3.3.1**: Delineation of Refined SWSA-gw **T3.3.2**: Groundwater Quality **T3.3.3**: Transboundary Aquifers **T3.3.4**: Updated Status Quo SWSA	NOT STARTED
	D3.4: SWSA-gw Protection and Management Report	**T3.4.1**: SWSA-gw Protection and Management	NOT STARTED
Phase 4: Project Closure			
P4	**D4.1**: Refined SWSA-gw of South Africa Report	**T4.1.1**: Report Integration	NOT STARTED
	D4.2: External Review Summary Report		NOT STARTED
	D4.3: Electronic Database		NOT STARTED
	D4.4: Close Out Report		NOT STARTED

COMPLETED DELIVERABLES

INCEPTION REPORT

- Project's scope (programme of deliverables & invoicing)
- High-level review of existing refinement methodologies
- Overview of the evolution of SWSA-gw of South Africa
- Stakeholder engagement plan
- Capacity-building and mentorship program

GAP ANALYSIS REPORT

- Project data catalogue
- Gap analysis and impact assessment
- Technical feasibility assessment
- Feedback loop to incorporate new data and stakeholder feedback
- Recommendations and strategic prioritization

https://www.dws.gov.za/wem/currentstudies/default.aspx

UPCOMING DELIVERABLES

Phase 3

Refinement of SWSA for Groundwater (SWSA-gw)

Stakeholder feedback has been consolidated, and steady progress is being made on Deliverable 3.1.

P3	Refinement of SWSA for Groundwater (SWSA-gw)	2024									2025										2026												2027		
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
T3.1.1	Status Quo SWSA Assessment																																			
D3.1	Status Quo SWSA Report												X																							
T3.2.1	Refined Methodology Assessment																																			
D3.2	Refined Methodology Report																X																			
T.3.3.1	Delineation of Refined SWSA-gw																																			
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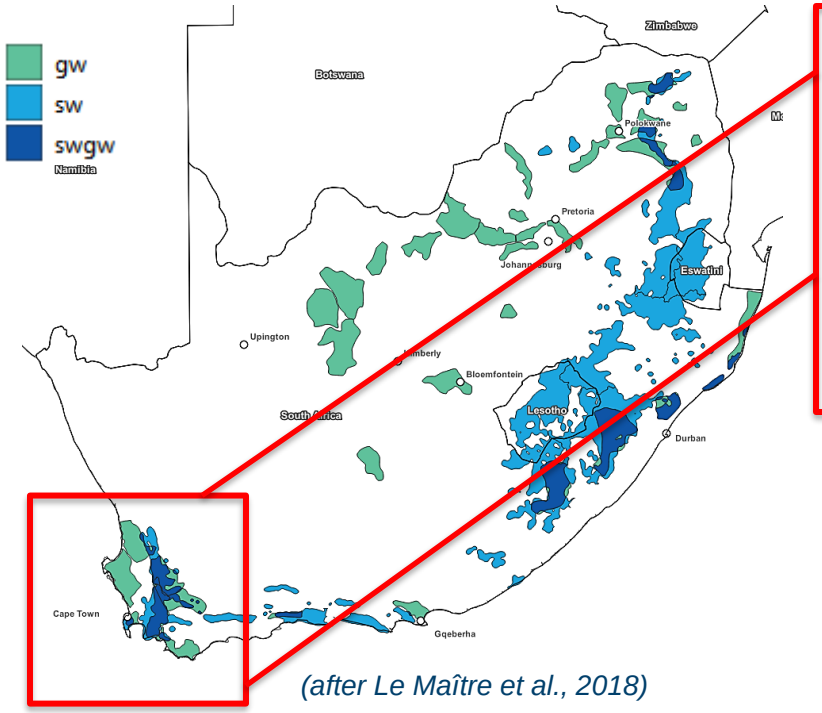
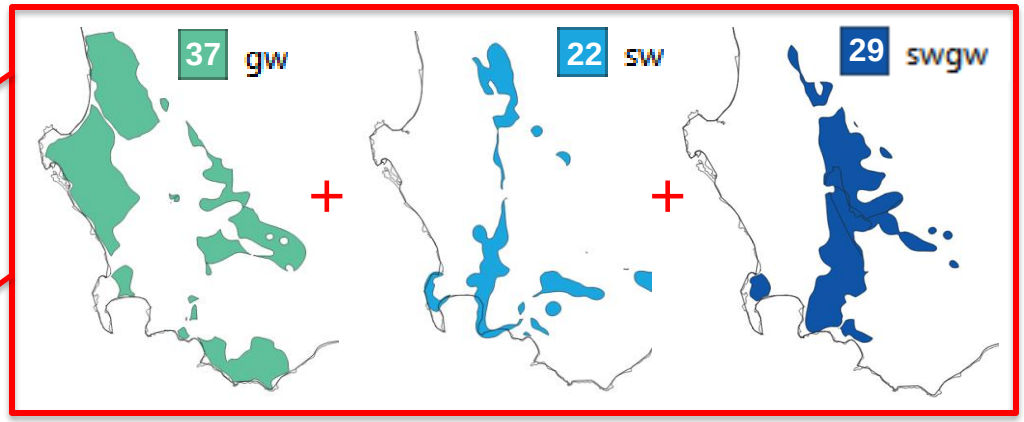
T.3.3.4	Updated Status Quo SWSA Assessment																																			
D3.3	Delineation of refined SWSA-gw Report																							X												
T3.4.1	SWSA-gw Protection and Management																																			
D3.4	SWSA-gw Protection and Management Report																																			

STATUS QUO REPORT

GROUNDWATER FOCUS

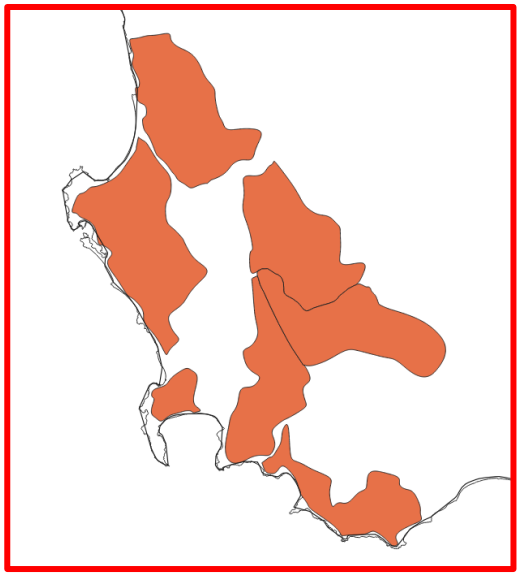




(after Le Maître et al., 2018)

To conduct a comprehensive review, the boundaries of the 37 SWSA-gw areas were combined with those of the 29 SWSA-swgw areas, creating groundwater-focused assessment areas. A total of 37 groundwater-focused areas (highlighted in orange) have been defined for the Status Quo assessment.

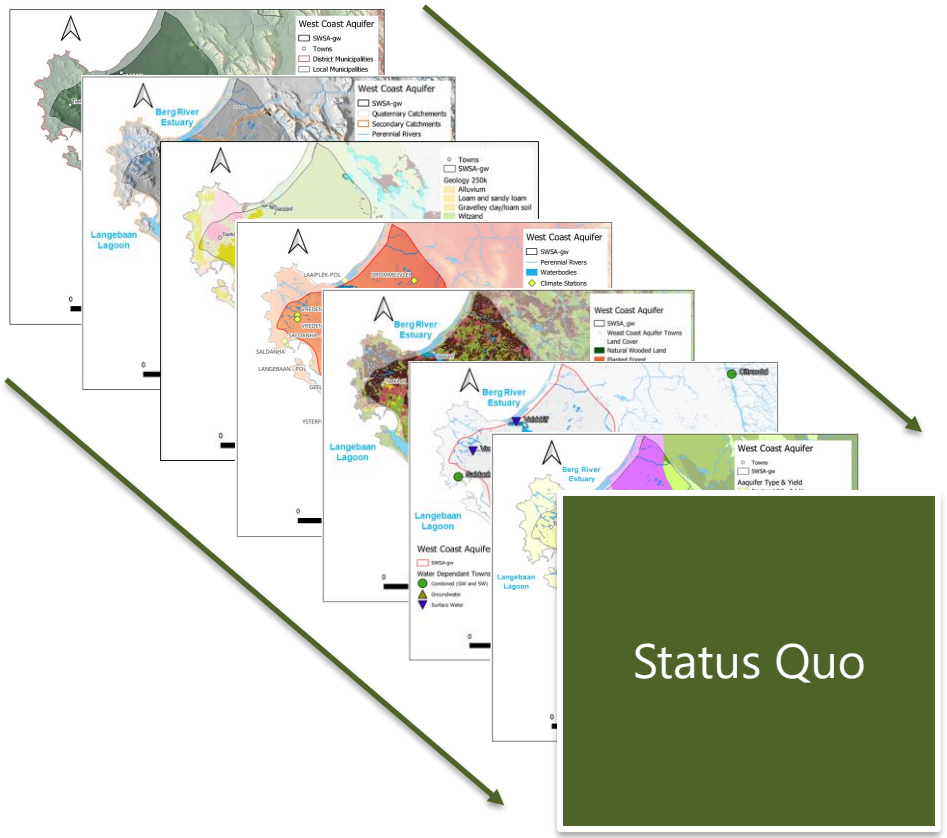
GW + SWGW



OBJECTIVES & APPROACH OF THE STATUS QUO REPORT

OBJECTIVES

1. Evaluate the current status of the 37 SWSA-gw
2. Evaluate and update the data into a usable format to identify data gaps.
3. Compile a comprehensive SWSA-gw specific Status Quo



Description

1. Geospatial Context

- **Geospatial Context**
  - ✓ Topography
  - ✓ Boundaries
  - ✓ Spatial Features

2. Hydrology & Drainage

- **Hydrology & Drainage**
  - ✓ Surface Water Features
  - ✓ Flow Regimes
  - ✓ Catchment Characteristics

3. Geology

- **Geology**
  - ✓ Lithology
  - ✓ Structural Geology

Status Quo

4. Quantity

5. Quality

- **Hydrogeology**
  - ✓ Aquifer Type
  - ✓ Groundwater Recharge
  - ✓ Hydraulic Properties
  - ✓ Groundwater Use
  - ✓ Groundwater Quality
  - ✓ Socio Economic

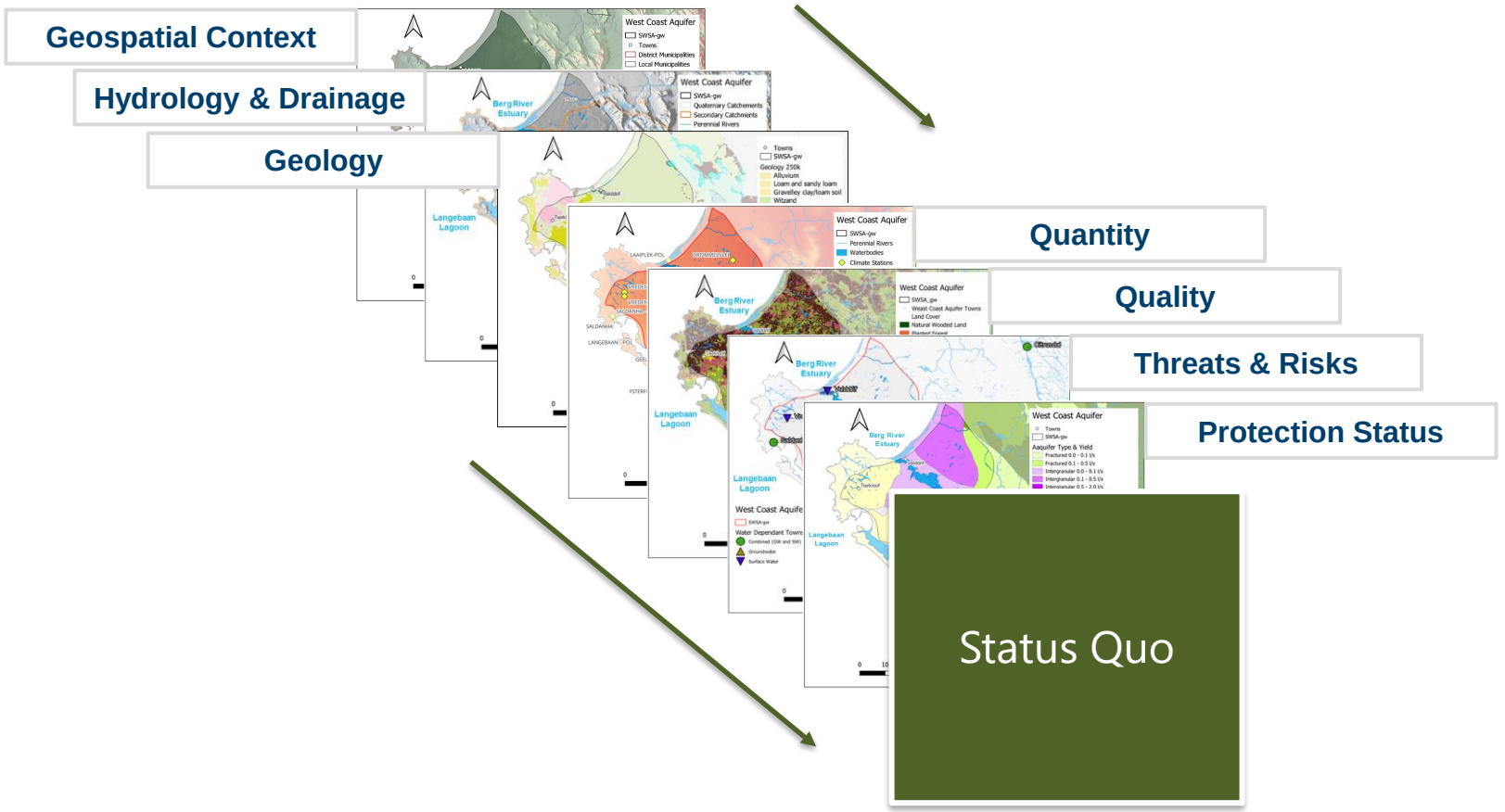
6. Threats & Risks

- **Climate**
- **Land Use**
- **Socio-Economic & Governance**

7. Protection Status

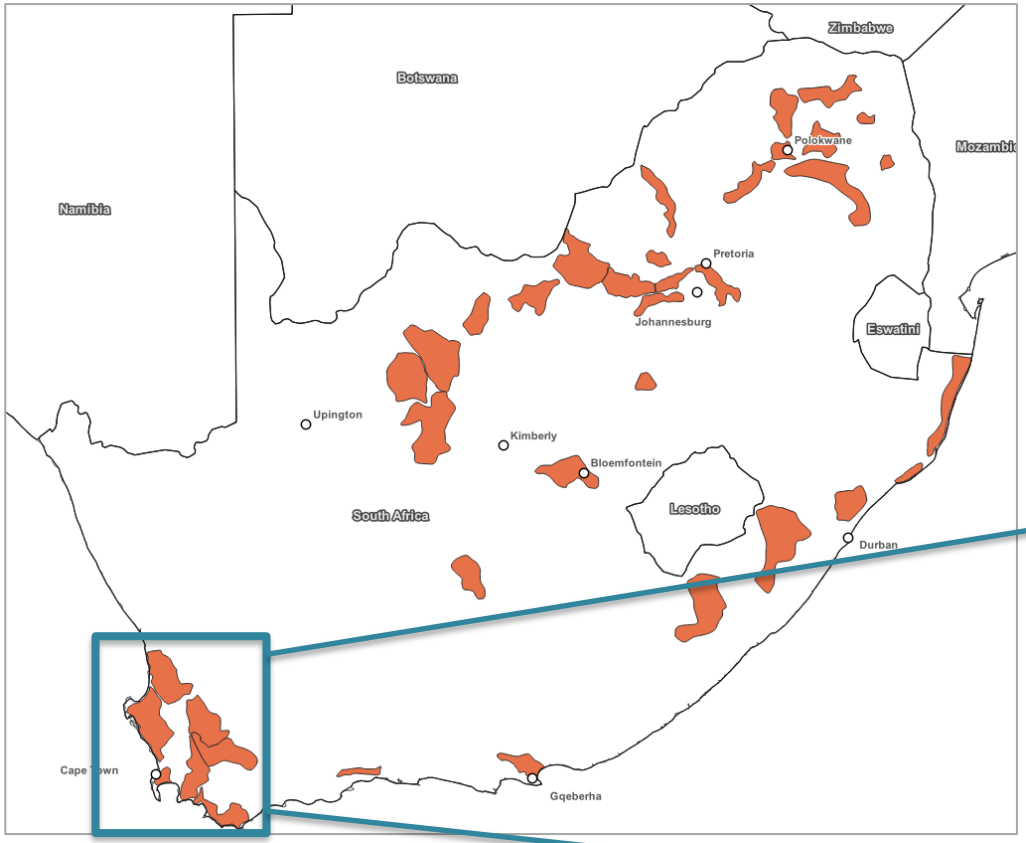
- **Biodiversity and Conservation**

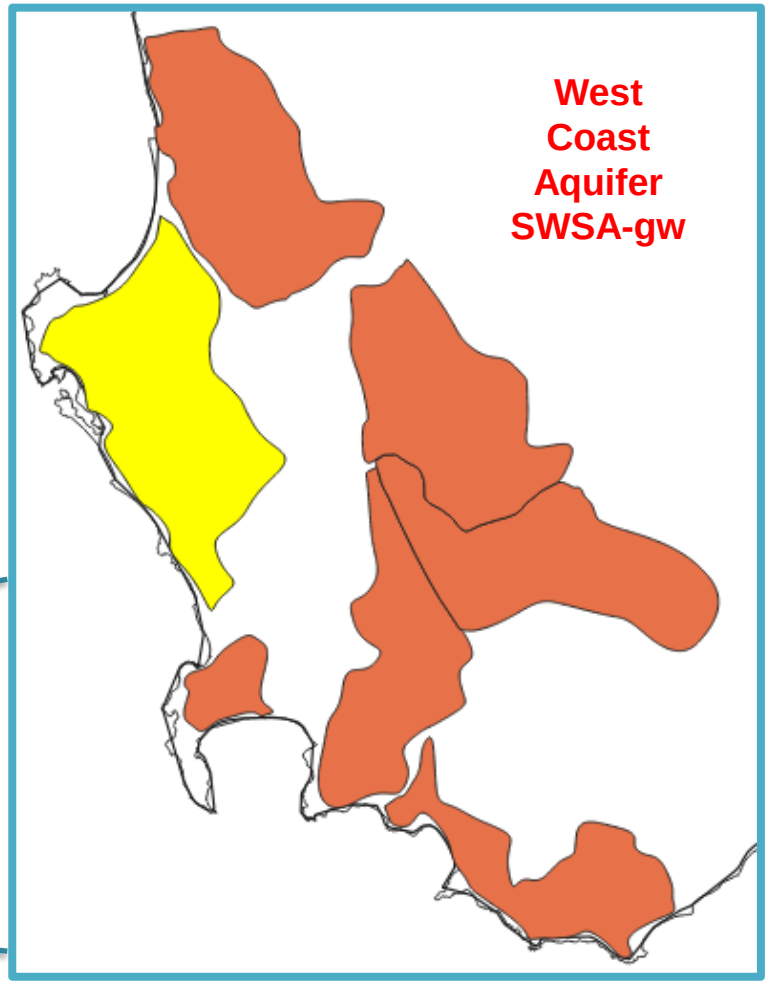
OBJECTIVES & APPROACH OF THE STATUS QUO REPORT

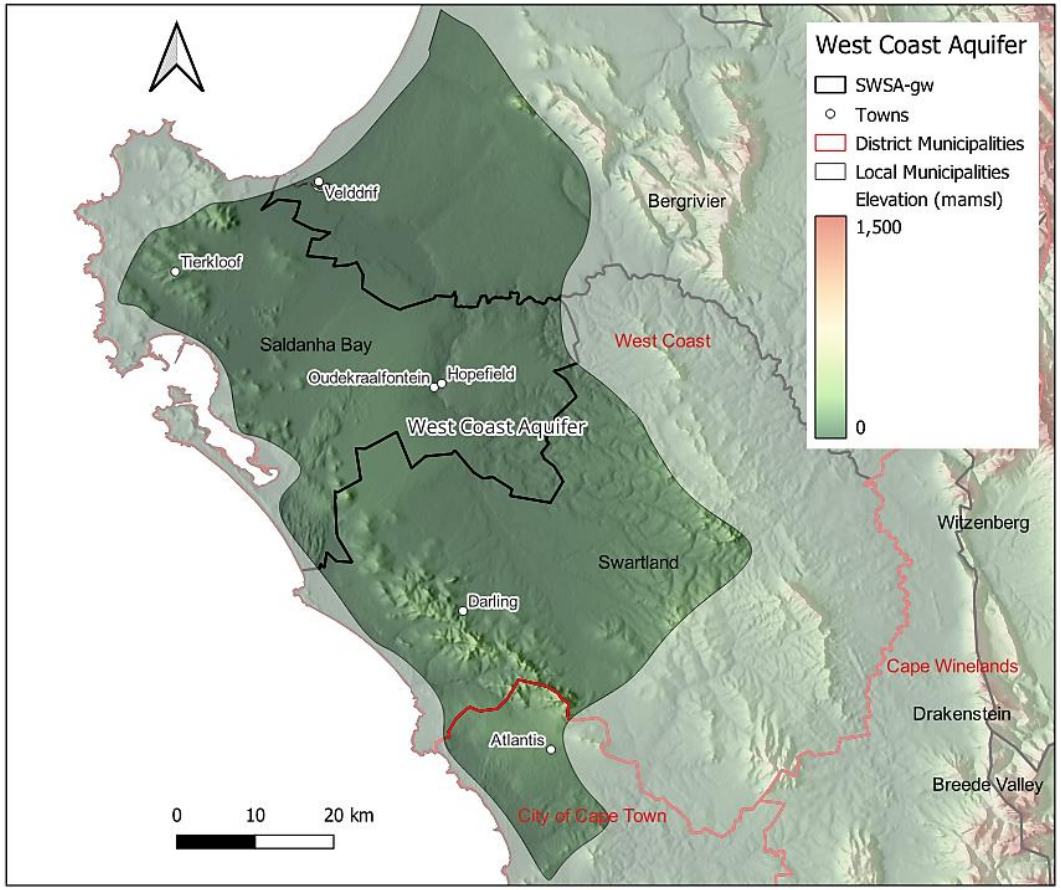


Status Quo Assessment Example

Example: West Coast Aquifer SWSA-gw





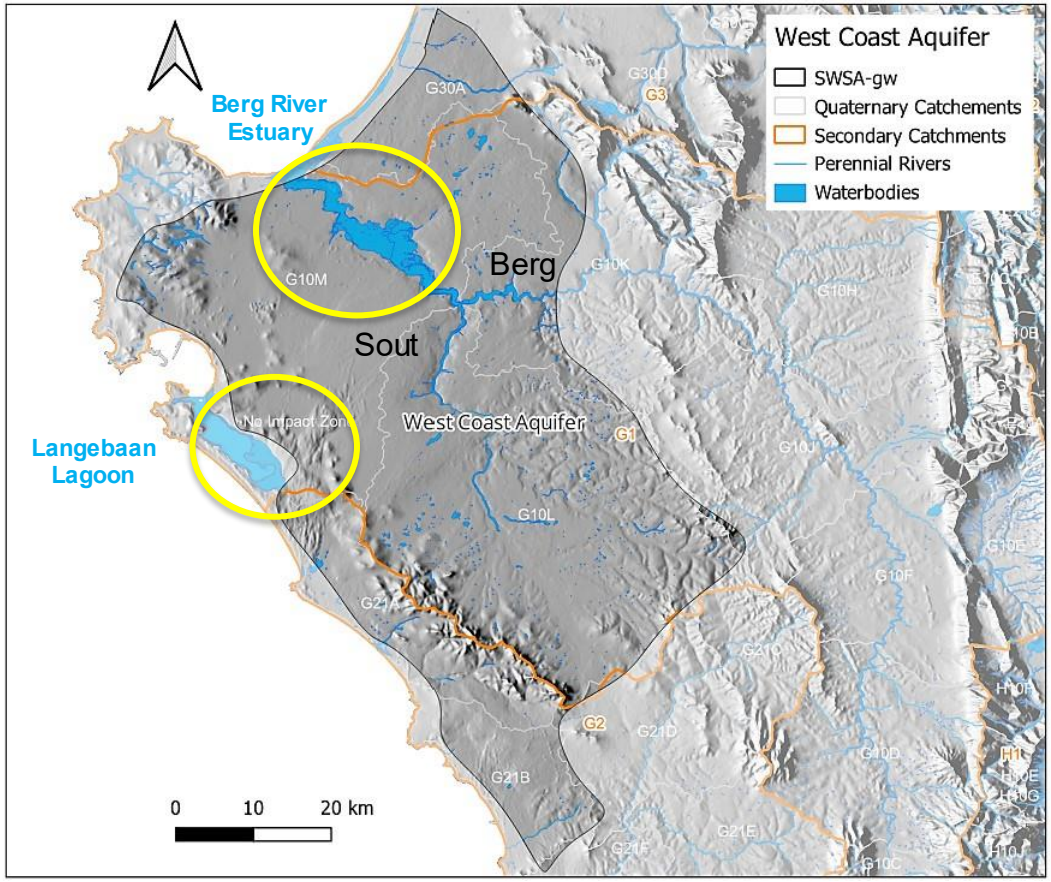


Description

1. Geospatial Context

- **Boundaries:**
  Country, Province, Municipality, Towns
- **Topography:**
  Elevation profile and terrain mapping
- **Spatial Features:**
  Major Roads, infrastructure, towns and settlements

The West Coast Aquifer SWSA-gw, covering approximately 4,586 km², is located in the Western Cape Province of South Africa. It spans the West Coast District Municipality and City of Cape Town Metropolitan Municipality. It includes major towns such as Darling, Atlantis, and Langebaan.

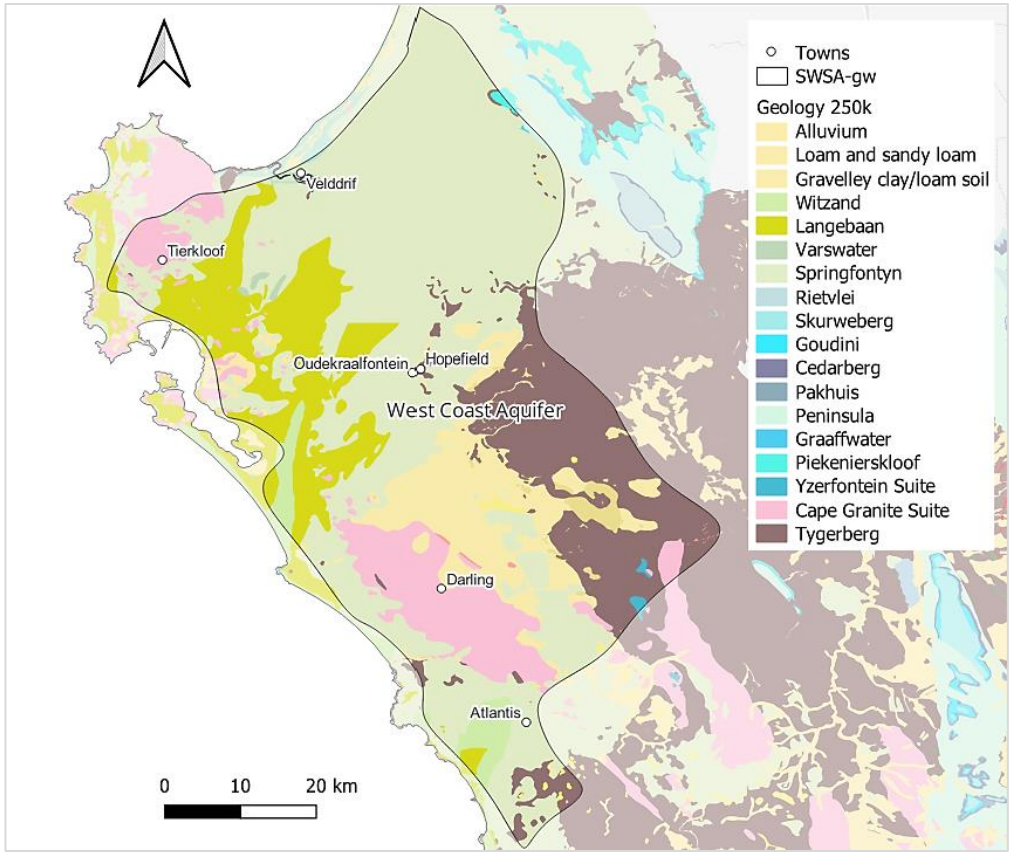


Description

2. Hydrology & Drainage

- **Surface Water Features:** Rivers, Streams, Wetlands
- **Flow Regimes:** Perennial, Intermediate, Ephemeral
- **Catchment Characteristics:** Boundaries, Flow Direction, Runoff

The area features four major surface water systems. These include Langebaan Lagoon, fed by the G2 catchment, and the Berg and Sout Rivers, along with the Berg River Estuary, fed by the G1 catchment. The Berg and Sout Rivers are perennial, flowing northwest to the Berg River Estuary. Surface water is limited by low rainfall, gentle topography, and permeable, sand-dominated geology.



Description

3. Geology

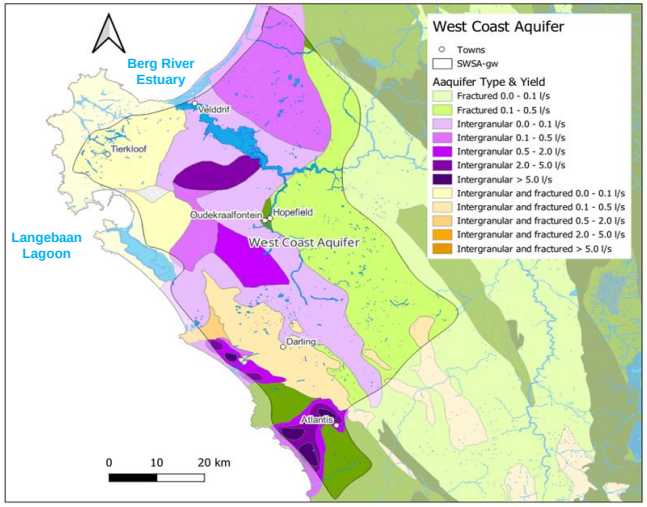
- **Lithology:**
  Rock types, formations, & structures
- **Structural Geology:**
  Faults, folds & fractures

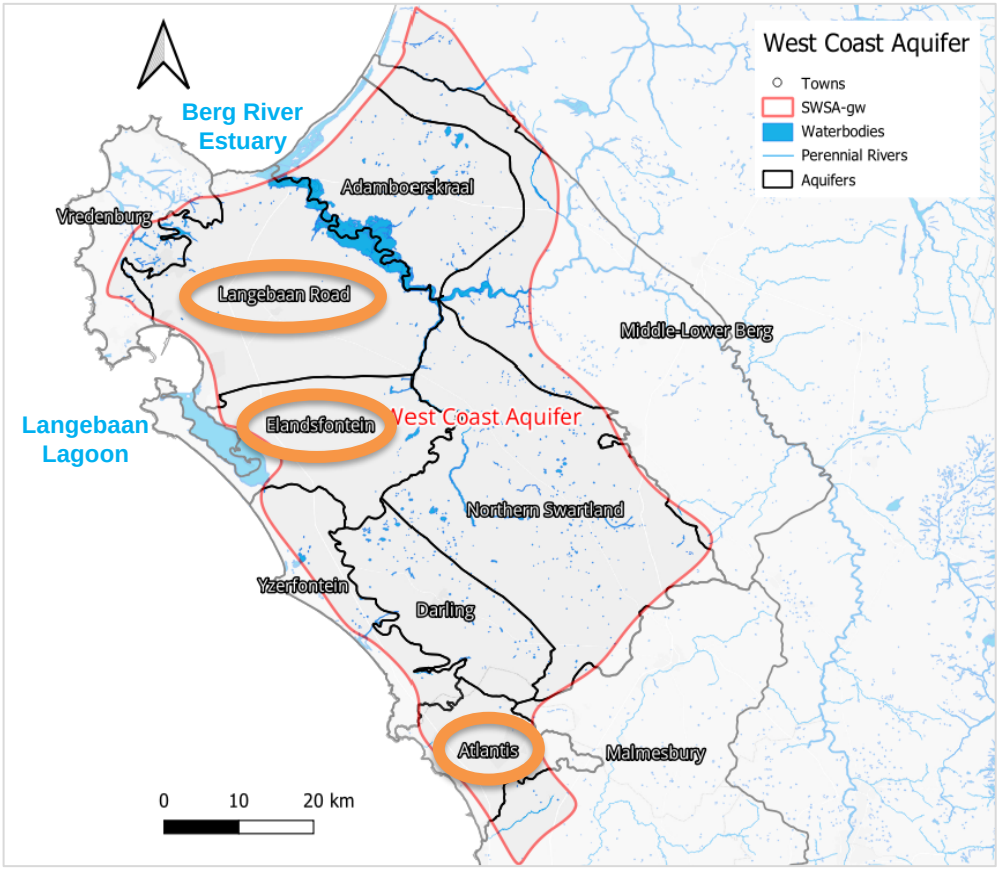
The area is geologically complex, with basement rocks (Malmesbury Group shales and Cape Granite Suite) overlain by Tertiary to Quaternary Sandveld Group sediments (Langebaan, Witzand, Springfontyn, and Varswater formations) averaging 50–70 m in thickness. Granites dominate the coast, while metamorphosed shales are common in the east. Ancient river systems, like the Berg River, have carved palaeochannels filled with high-yielding Elandsfontyn Formation sediments, enhancing groundwater storage and flow.

Status Quo

4. Quantity

- **Aquifer Type**
  Type, Description, etc
- **Groundwater Recharge:**
  Recharge areas, rates and mechanisms
- **Hydraulic Properties:**
  Conductivity, Transmittivity, etc
- **Groundwater Use:**
  Volume, User, Water Use Sector, etc
- **Groundwater Quality:**
  Major Ions, Metals, etc





Major Aquifers in The West Coast Aquifer SWSA-gw

- **Langebaan Road Aquifer**
- **Elandsfontein Aquifer**
- **Atlantis Aquifer**

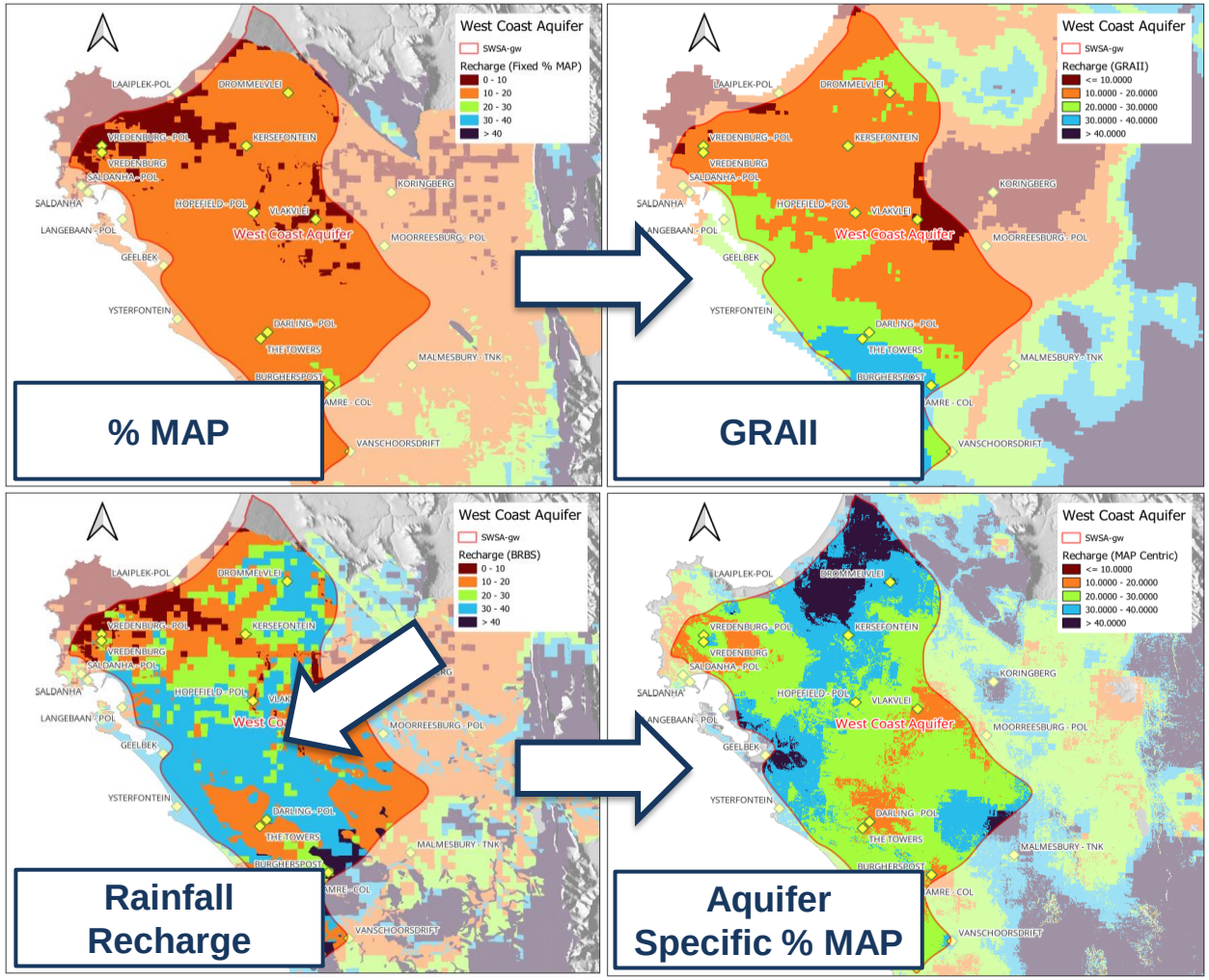
Status Quo

4. Quantity

RECHARGE

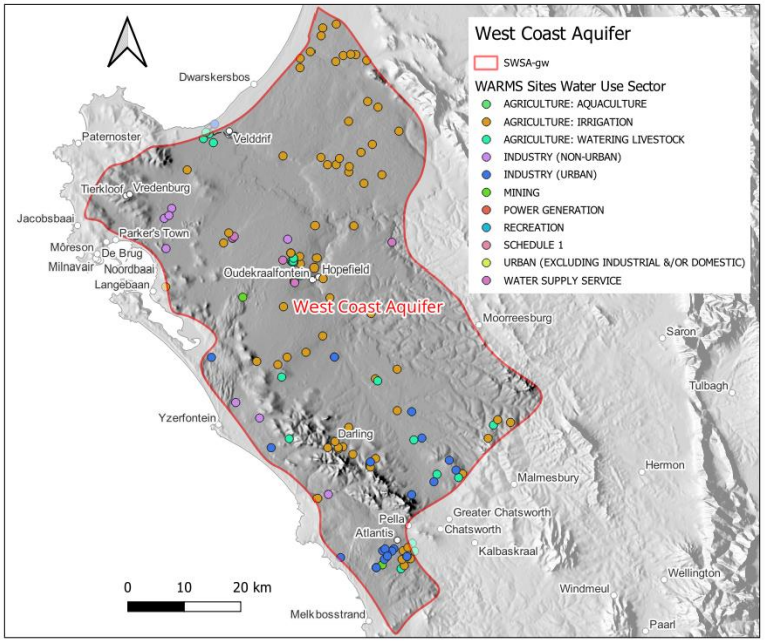
Estimating groundwater recharge is a complex process that requires a detailed understanding of hydrogeology.

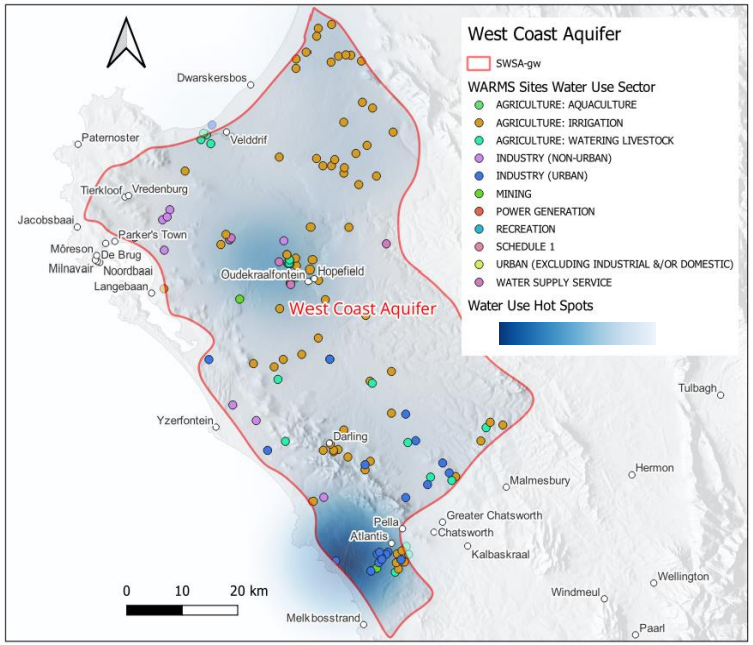
Various methods, beyond using a % of Mean Annual Precipitation (MAP), can be employed to estimate recharge. These include models such as the GRAII, BRBS Rainfall-Recharge Relationships, and the Berg WAAS Map-Centric Methods.



Status Quo

4. Quantity



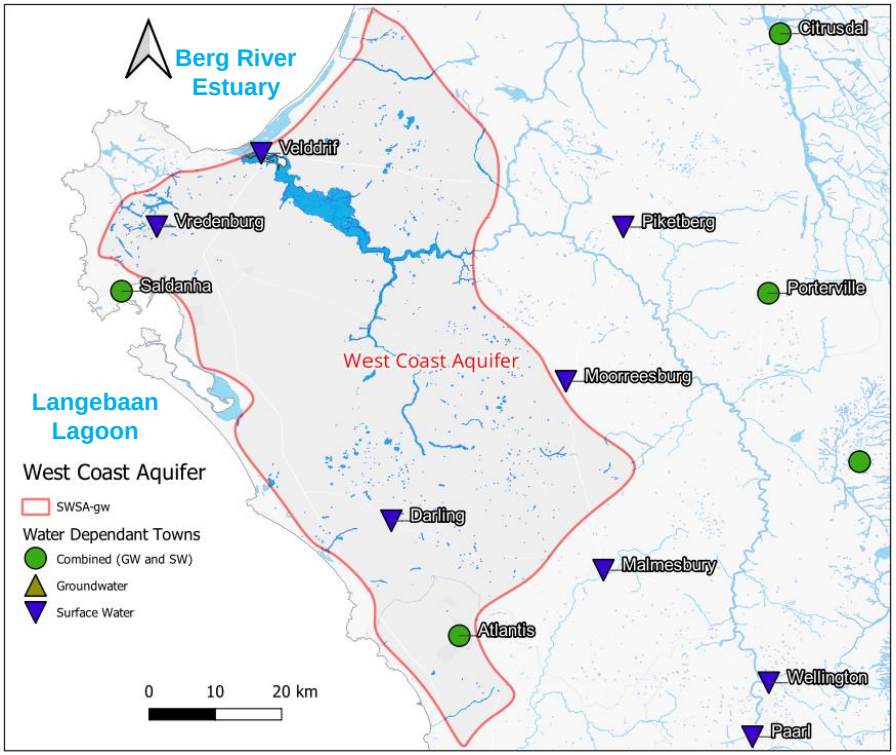


GROUNDWATER USE

Water User Sector	Registered Volume (Mm³/a)
Agriculture: Irrigation	8.1006786
Agriculture: Watering Livestock	0.542967
Industry (Non-urban)	0.0956815
Industry (Urban)	8.618614
Mining	0.868
Water Supply Service	1.606863
Total	19.832804

Status Quo

4. Quantity



SOCIO-ECONOMIC & GOVERNANCE

- **Population Dynamics:**
  Density, Growth Rates, GW dependence
- **Infrastructure:**
  Bulk Water Supply
- **Governance:**
  Policies, regulations, management plans
- **Stakeholders:**
  Public and Private

Population 2011
66 931
Population 2025
~73 624

Towns like Saldanha and Atlantis rely on a combination of groundwater and surface water, while Velddrif, Vredenburg, and Darling primarily depend on surface water. The population in these areas has grown by an estimated 10% between 2011 and 2024.

Status Quo

5. Quality

GROUNDWATER QUALITY

Langebaan Road Aquifer

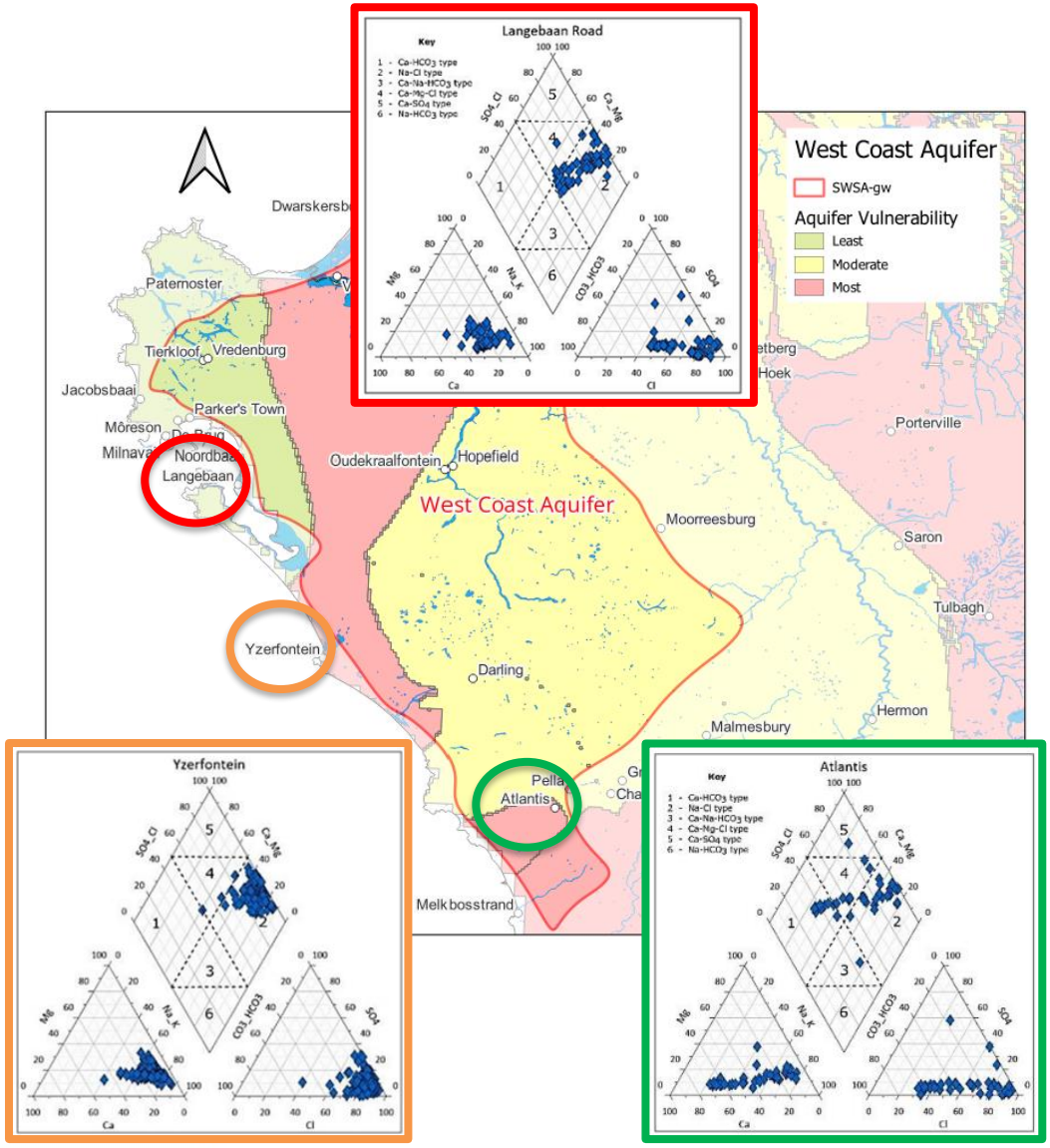
- Primary water type: Na-Cl.
- Source: Marine aerosols and coastal rainfall recharge .
- Boreholes near Tygerberg Fm contribute elevated Na and Cl. Notable absence of Ca-HCO_3 water type, despite calcite-rich Langebaan Fm.

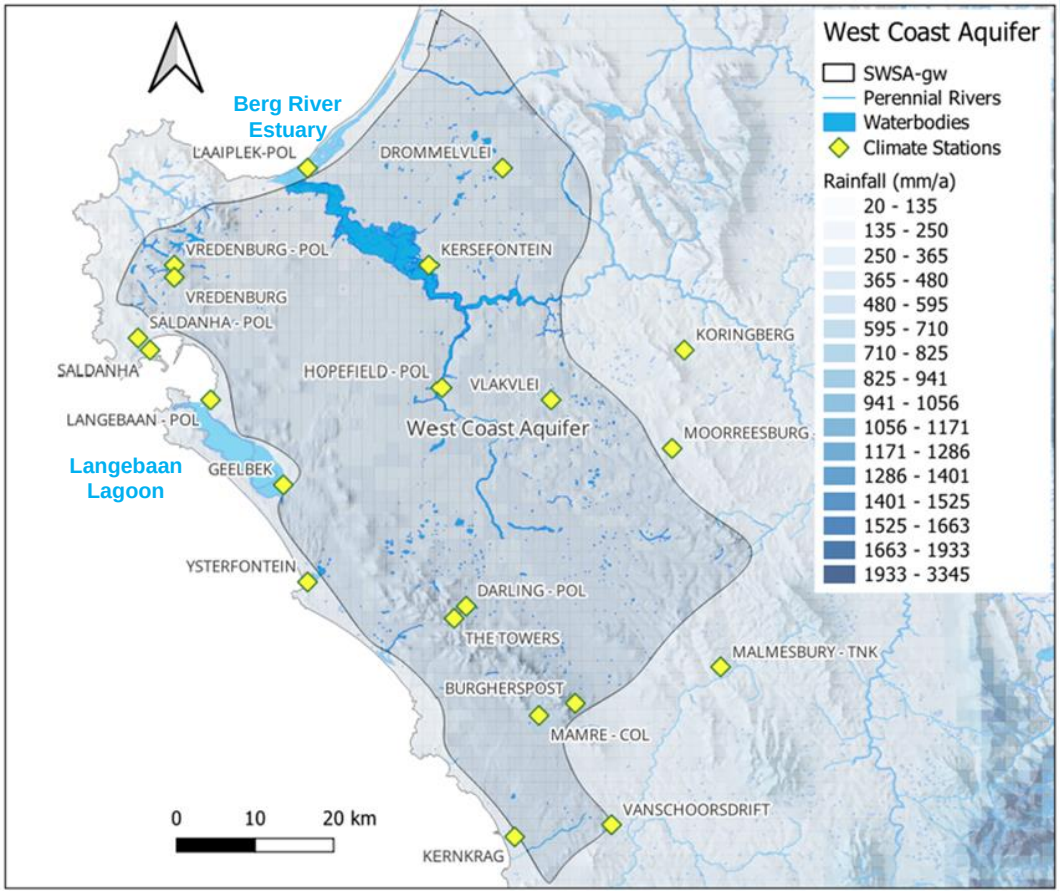
Yzerfontein Aquifer

- Primary water types: Na-Cl and Ca-Mg-Cl.
- Na-Cl: Marine aerosols and coastal rainfall recharge.
- Ca-Mg-Cl: Result of Na^+ cation exchange with Ca^{2+} and Mg^{2+} in Langebaan and Witzands Fms.

Atlantis Aquifer

- Primary water types: Na-Cl and Ca-HCO_3.
- Na-Cl: Marine aerosols, coastal rainfall recharge, and influence of Tygerberg Fm.
- Ca-HCO_3: Dissolution of calcium carbonate in Witzands Fm.





Status Quo

6. Threats & Risks

RAINFALL

- **Rainfall:**
  MAP Annual and Seasonal Trends
- **Temperature:**
  Annual and Seasonal Trends
- **Evapotranspiration:**
  Rates and Impacts

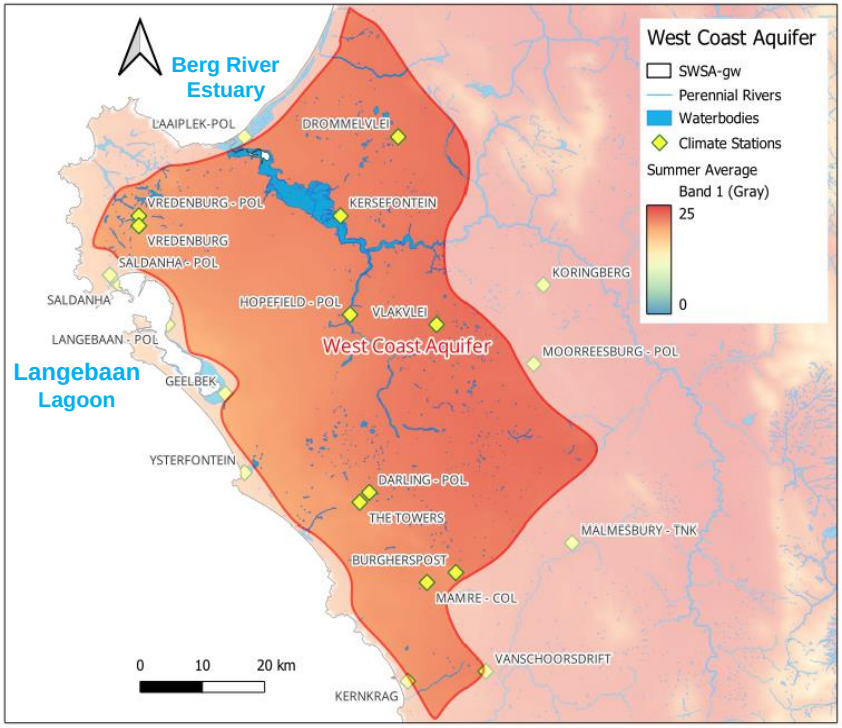
Climate Stations

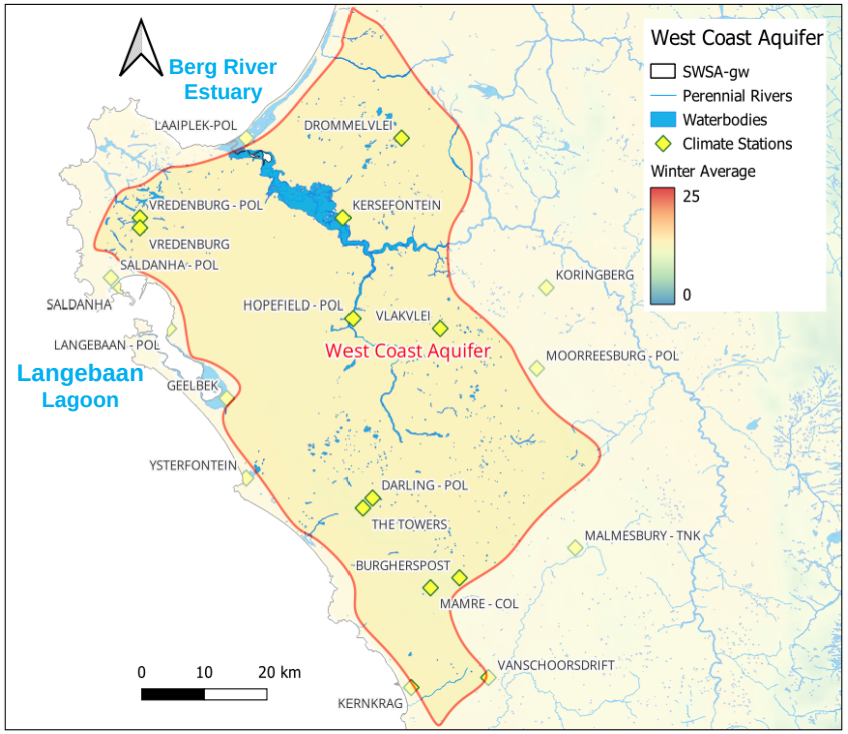
KERNKRAG	THE TOWERS	SALDANHA - POL
MAMRE - COL	DARLING - POL	VREDENBURG - POL
VANSCHOORSDRIFT	VLAKVLEI	LAAIPLEK-POL
LANGEBAAN - POL	BURGHERSPOST	KERSEFONTEIN
GEELBEK	MOORREESBURG - POL	DROMMELVLEI
YSTERFONTEIN	KORINGBERG	SALDANHA
HOPEFIELD - POL	MALMESBURY - TNK	VREDENBURG

The area has a Mediterranean climate, with mild, wet winters (average MAP ~130–360 mm/a, mainly from May to August) and hot, dry summers. Winter rains provide most aquifer recharge, while summer coastal fog supports local ecosystems. However, high evaporation rates, often exceeding rainfall, increase surface water scarcity, making groundwater a critical resource.

Status Quo

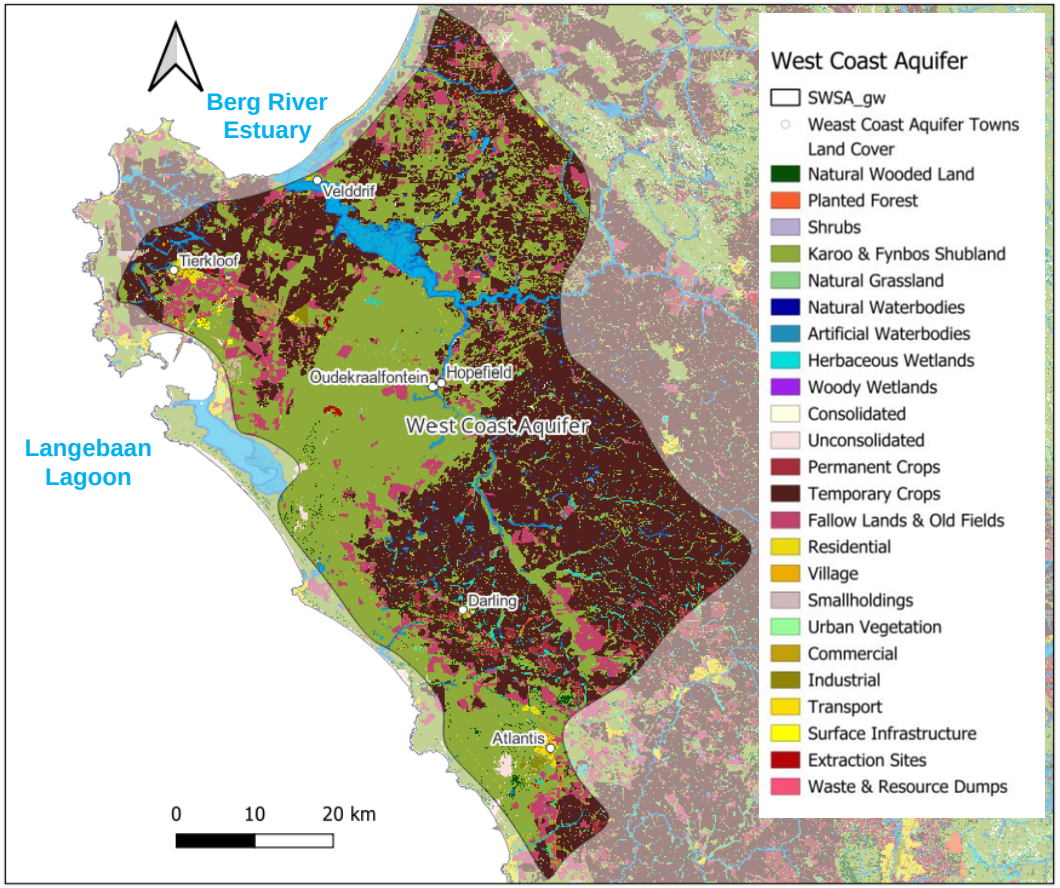
6. Threats & Risks





CLIMATE CHANGE

The West Coast of South Africa has moderate to high temperatures, with hot summers (25–35 ºC) and mild winters (15–20 ºC). Coastal areas benefit from cool sea breezes, while inland regions experience more extreme temperatures. High summer heat increases evaporation, impacting water resources.



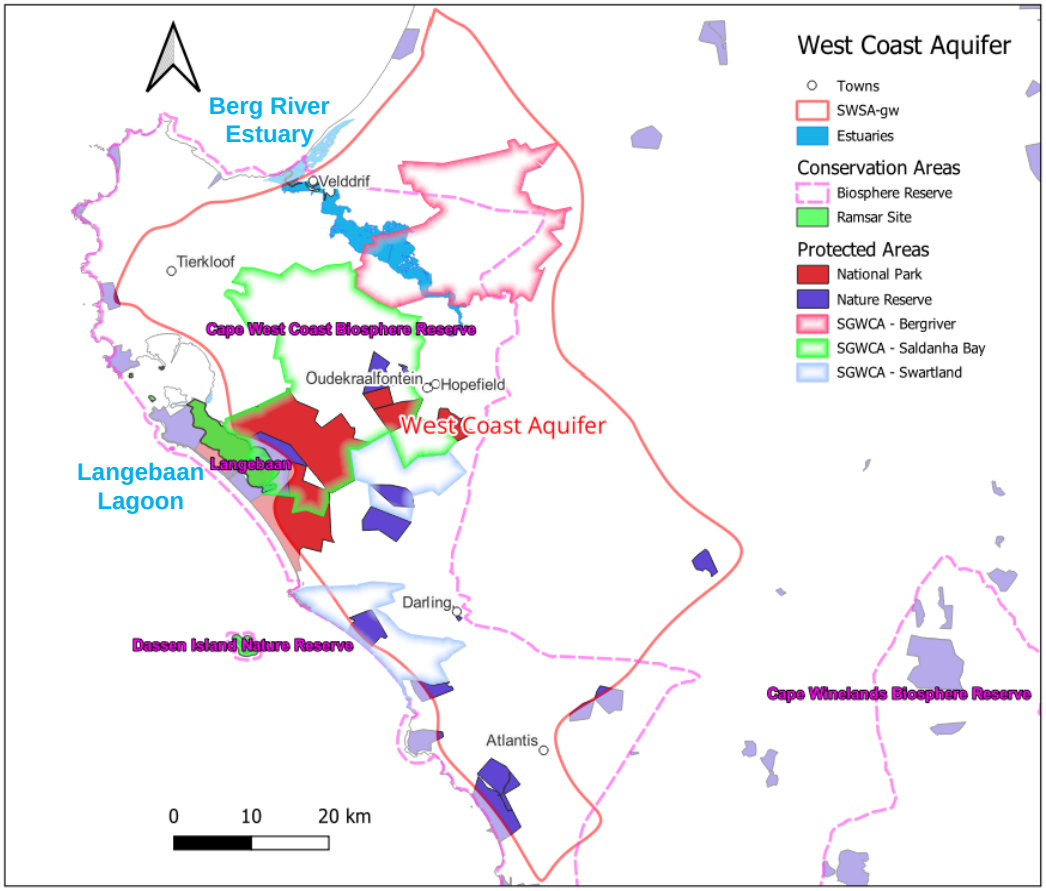
Status Quo

6. Threats & Risks

LAND USE

- **Land Cover:**
  Urban, Agri, Cultivated, Forested
- **Land Use Change:**
  Deforestation & Urbanization
- **Environmental Impacts:**
  Pollution Sources
- **Mineral resources**
  Mining activity.

Urban and industrial activities are concentrated in Atlantis and Langebaan, while agriculture dominates in Elandsfontein and Adamboerskraal. Yzerfontein remains largely covered by natural vegetation due to minimal development and conservation efforts along the West Coast, Langebaan Lagoon, and Berg River Estuary.



Status Quo

7. Protection Status

ECOLOGY, BIODIVERSITY, AND CONSERVATION

- **Major GW Dependent Ecosystems:** Wetlands, Estuaries, Aquatic Systems
- **Protected Areas:** National Parks, Reserves, CBAs, and Subterranean Government Water Control Areas (SGWCA)

Much of the area, including the Berg River Estuary and Langebaan Lagoon, lies within the Cape West Coast Biosphere Reserve. The reserve includes the West Coast National Park and several private nature reserves. Langebaan Lagoon is also a designated Ramsar site.

UPCOMING EVENTS

REFINEMENT OF STRATEGIC GROUNDWATER SOURCE AREAS OF SOUTH AFRICA

Phase	Code	Task / Deliverable	2024									2025												2026												2027		
			Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
0	P0	Project Management / Capacity Building																																				
	P0.1	General Project Management	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	P0.2	PMC Meetings	1		1			1			1			1				1				1			1				1		1			1			1	
	P0.3	PSC Meetings					1						1				1												1					1				
	P0.4	PS Meetings					1															1														1		
	P0.5	Ad Hoc Meetings								1			1			1			1				1				1												
	P0.6	Monthly Progress Reports	1		1	1	1		1	1	1	1	1		1	1	1		1	1	1	1	1	1		1	1	1	1	1		1	1			1		
	P0.7	Capacity Building				1							1			1					1			1					1									

Dec

S	M	T	W	T	F	S
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

- PMC-02: 17th December 2024
- Monthly Progress Report

Jan

S	M	T	W	T	F	S
			01	02	03	04
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

- Monthly Progress Report

Feb

S	M	T	W	T	F	S
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

- D2.1 Capacity Building 02
- PSC-02: 18th February 2025
- Monthly Progress Report

Mar

S	M	T	W	T	F	S
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

- PMC-02: 19th March 2025

STAKEHOLDER ENGAGEMENT

STAKEHOLDER ENGAGEMENT PLAN

Stakeholder engagement is aimed at ensuring that all the concerns related to the SWSA-gw identification and refinement process are thoroughly represented and effectively addressed.

STAKEHOLDER ENGAGEMENT PLAN

1. **Identify Key Stakeholders**
   a) Stakeholder List (continually updated)
2. **Define Stakeholder Motives**
   a) PSC-01 & PS-01 (understand initial concerns)
3. **Setup Stakeholder Comments Register**
   a) Prioritization of comments (in consultation with DWS Project Managers)
4. **Responses**
   a) Documentation of Responses (in consultation with DWS PM)
5. **Communication Channels**
   a) PSC & PS meetings
   b) Email Responses
   c) Published Reports

STAKEHOLDER ENGAGEMENT

Objectives with PSC Members

- ✓ **Guidance & Oversight:** Align the project with strategic goals and policies.
- ✓ **Stakeholder Representation:** Address interests of stakeholders, including government and communities.
- ✓ **Resource Assistance:** Facilitate access to necessary resources and support.

Role of PSC Members

- ✓ **Advisory Role**: Offer expert advice and recommendations.
- ✓ **Monitoring & Evaluation:** Track progress, assess risks, and ensure objectives are met.
- ✓ **Liaison Function:** Bridge communication between the project team and stakeholders.

CONTACT DETAILS		
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CAPICITY BUILDING

CAPACITY BUILDING

Associated Task	Capacity Building Details	Date Scheduled	Type of Training
T2.1.1	Data and Information Assessment	16th Jul 2024	Type: Workshop (CPT) Face-to-Face Session: 1 Day
T3.1.1	**Status Quo SWSA-gw Assessment**	**13th Feb 2025**	**Type: Workshop (CPT) Face-to-Face Session: 1 Day**
T3.2.1	Refined Methodology Assessment	May 2025	Type: Workshop (CPT) Hybrid Session: 1 Day
T3.3.1	Delineation of Refined SWSA-gw	Oct 2025	Type: Workshop (CPT) Face to Face Session: 2 Days
T.3.3.4	Updated Status Quo SWSA-gw	Jan 2026	Type: Workshop (CPT) Face to Face Session: 2 Days
T3.4.1	SWSA-gw Protection and Management	Jul 2026	Type: Workshop (CPT) Hybrid Session: 1 Day

Date: 13th February 2025

Participants:
- 7 DWS officials, 3 Umvoto team members

Objective:
- to assess the current status of the SWSA-gw using specialized software and tools such as Google Earth Engine, QGIS (utilized for visualization)

Key Activities:
- Produce report quality geospatial maps per SWSA-gw, including sourcing, editing, styling attributes

Tools & Technologies:
- Training on QGIS and Google Earth.
- Focus on Styling and Thematic Layers as well as Quality Control

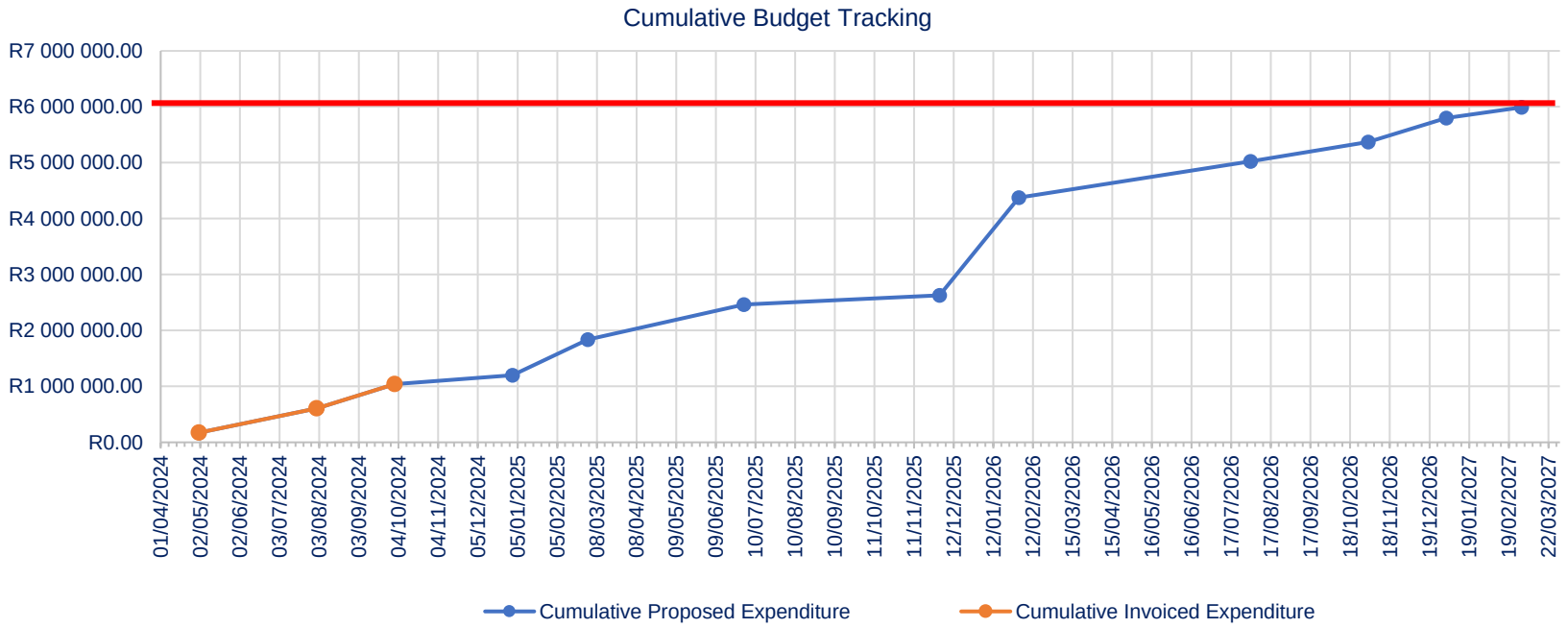
Outcome:
- Support the Capacity Building objectives outlined in the Inception Report (Deliverable 1.1).

Financial Summary

REFINEMENT OF STRATEGIC GROUNDWATER SOURCE AREAS OF SOUTH AFRICA

Invoice Month	Proposed Expenditure (incl. VAT)	Cumulative Proposed Expenditure (incl. VAT)	Cumulative Invoiced Expenditure (incl. VAT)	Submitted/Paid
May-24	R172,971.50	R172,971.50	R172,971.50	Paid
Aug-24	R433,994.67	R606,966.17	R606,966.17	Paid
Oct-24	R435,056.50	R1,042,022.67	R1,042,022.67	Paid
Feb-25	**R155,476.17**	**R1,197,498.84**		
Mar-25	R642,424.50	R1,839,923.34		
Jul-25	R622,583.17	R2,462,506.51		
Dec-25	R168,402.17	R2,630,908.68		
Feb-26	R1,746,512.67	R4,377,421.35		
Aug-26	R647,342.67	R5,024,764.02		
Nov-26	R344,252.50	R5,369,016.52		
Jan-27	R428,007.00	R5,797,023.52		
Mar-27	R193,165.50	R5,990,189.02		

** As discussed in PMC-03, the PSC-02 and CB-02 have been rescheduled to February 2025, resulting in an updated invoicing schedule. The January 2025 invoice has now been shifted to February 2025.*



DISCUSSION & QUESTIONS