Understanding the complex geographic context of Cape Flats Area

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Purpose:

The purpose of the document is to highlight the importance of the Cape Flats Water Management Area. Also, the document seeks to highlight the challenges facing the Cape Flats area and propose feasible solutions that ensure sustainable development through a mutual benefit of both the environment and livelihoods.

Introduction:

Water resources are an important form of natural capital for supporting biodiversity and livelihoods. Water resources contribute to livelihoods by providing important services like potable water, climate regulation, ecosystem services, agricultural production, industrialization, and recreational activities. Water resources are globally facing numerous challenges that impact quality and quantity like climate change, pollution, infrastructure degradation, ecosystem degradation, and poor water governance. Recognizing and addressing the value of water resources and adopting sustainable practices can promote social, economic, and environmental development.

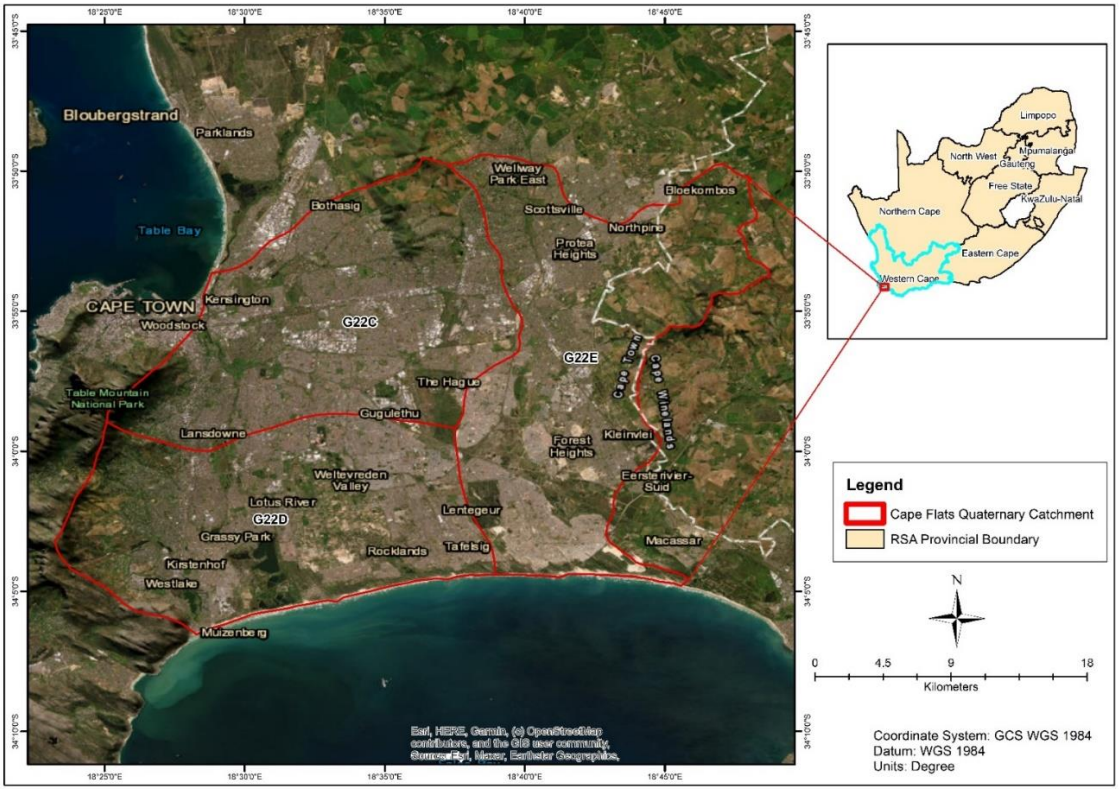

Figure 1: Cape Flats area

The Cape Flats (CF) is a significant part of the Cape Flats Metropolitan Area in Cape Town and falls under the Greater Cape Town Water Management Area (GCTWMA). The area is essential for both surface water (rivers,

wetlands) and groundwater resources. The Cape Flats face environmental challenges such as air and land pollution, river, and wetland degradation. Various organizations have participated in efforts to restore the natural infrastructure, however, managing a highly populated water management area with varying socio-economic standards, is not easily feasible socially, economically, and environmentally. Cape Town is classified as a high-risk area for water scarcity and is likely to remain like that if no immediate interventions are put in place. Protecting the Ecological Infrastructure and ensuring its functional state is essential for sustainable development and water security.

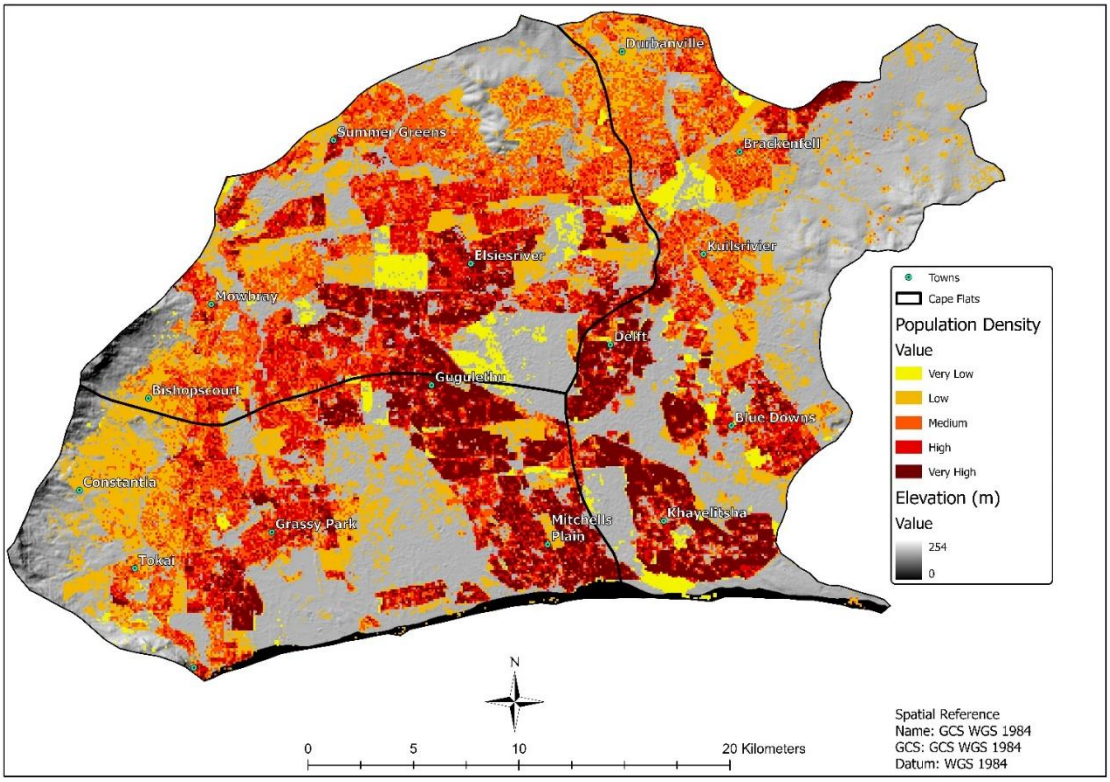

Figure 2:Population density of the Cape Flats

The CF is approximately 630km2 with a population of more than 5 million people and consists of both townships and suburbs. The population is unevenly distributed and largely dependent on the racial and economic distribution. The densely populated townships like Khayelitsha, Mitchells Plain, and Gugulethu are characterized by informal settlements, high poverty and unemployment rate and are predominantly inhabited by poor Cape Malaysians and Africans. In contrast, the suburbs such as Constantia and Bishopscourt are generally dominated by the White population. High density in these township areas has resulted in social challenges like high rates of crime, unemployment, and social infrastructure and environmental challenges like extreme levels of pollution, flooding, and ecological infrastructure degradation. High population with poor standards of living are predictors of pollution and EI degradation. Therefore, poor standards of living like poor sanitation and social infrastructure degraded are the main causes of EI degradation.

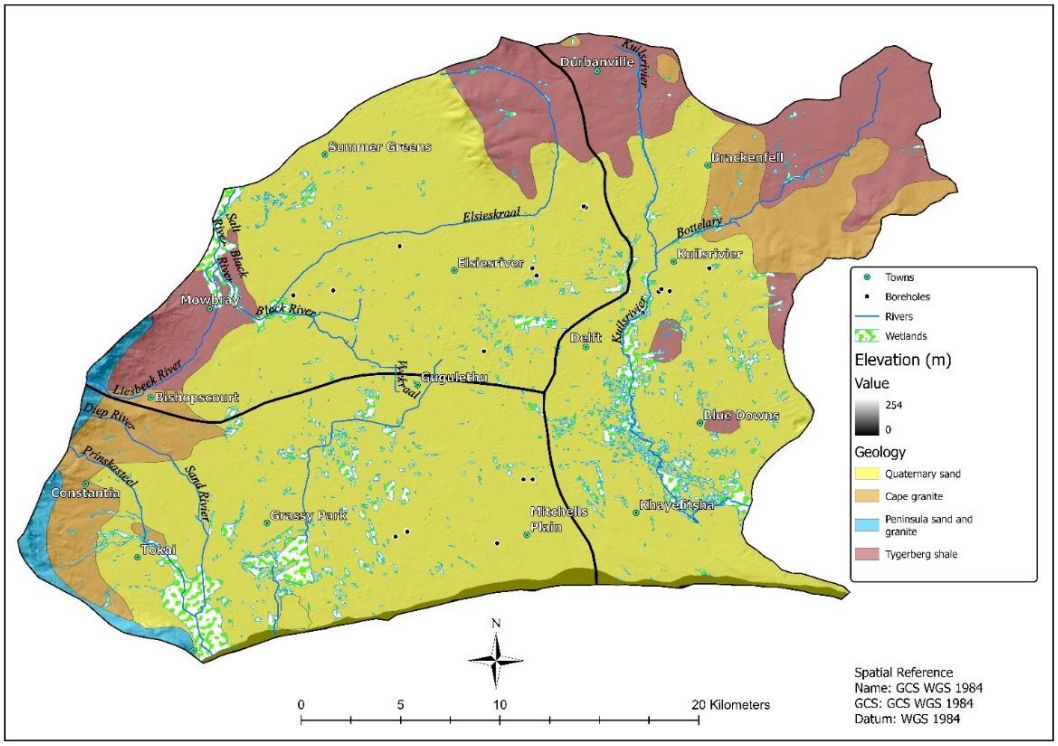

Figure 3: Hydrogeologic map of the Cape Flats and Illustration of groundwater flow

Geology:

The Cape Flats is a coastal plain sand formed within the mountains of the Cape Town metropolitan area (Adelana, Xu and Vrbka, 2010). The area forms part of the undulating sandy area made of 'Late-Tertiary and

Recent sands' that are averagely 50m thick, overlying the Malmesbury shale (Tredoux et al. 1980). The geologic properties of the cape flats make it a suitable water storage system.

Hydrogeology:

The CF aquifer forms shallow unconfined sand found within the central part of the area. Cape Flats Aquifer is mainly characterised by loose sands with interbedded clay and peat layer causing some parts of the aquifer to be semi-confined (Henzen 1973, Gerber 1976). The main source of recharge is rainfall. Some contributing sources of recharge are leakages of sewer and water supply pipes and urban irrigation return flows (Gxokwe, 2017). The groundwater flows towards the coastline.

Table 1: Ecosystem services derived from groundwater in the CF area

Category	Groundwater services
Provisioning	Water supply services for municipal and private use
	Support agricultural production
	Serves as backup during times of water scarcity or disruptions in the regular water supply
Regulating	Acts as a natural filtration system, removing impurities and pollutants from water
	Serves as a natural reservoir for storing water
	Feeds ecological infrastructure like wetlands
Supporting	Water-security, a back-up to surface water supply
	Flood mitigation, absorbing excess water and regulating its flow
Cultural	Groundwater for recreation such as gardens, and sports fields
	Recreation
	Research

Surface water:

The watercourse of the Cape Flats area is represented by rivers namely, Eerste River, Kuils River and the Diep River, as well as Zeekoevlei, and streams namely Lourens, Elsieskraal, Lotus Hout, Sout, Liesbeek, and Sir Lowry's Pass, which are discharging into the main rivers. The area also has different freshwater systems like rivers and wetlands. Most of the wetlands are groundwater dependent meaning they are sustained by groundwater discharge during the dry periods. Wetlands play an important role in supporting aquatic and terrestrial, filtering and cleaning water of natural and man-made pollutants.

Table 2: Ecosystem services derived from rivers and wetlands in the CF area

Category	Rivers and wetlands services
Provisioning	Water supply services for municipal and private use
	Support agricultural production

Regulating	Regulating water flow and preventing flooding
	Serves as natural filters and purifiers for improving water quality
	Climate regulation
Supporting	Water-security, surface water supply
	Flood mitigation and regulating water flow
Cultural	Cultural and traditional heritage like baptism

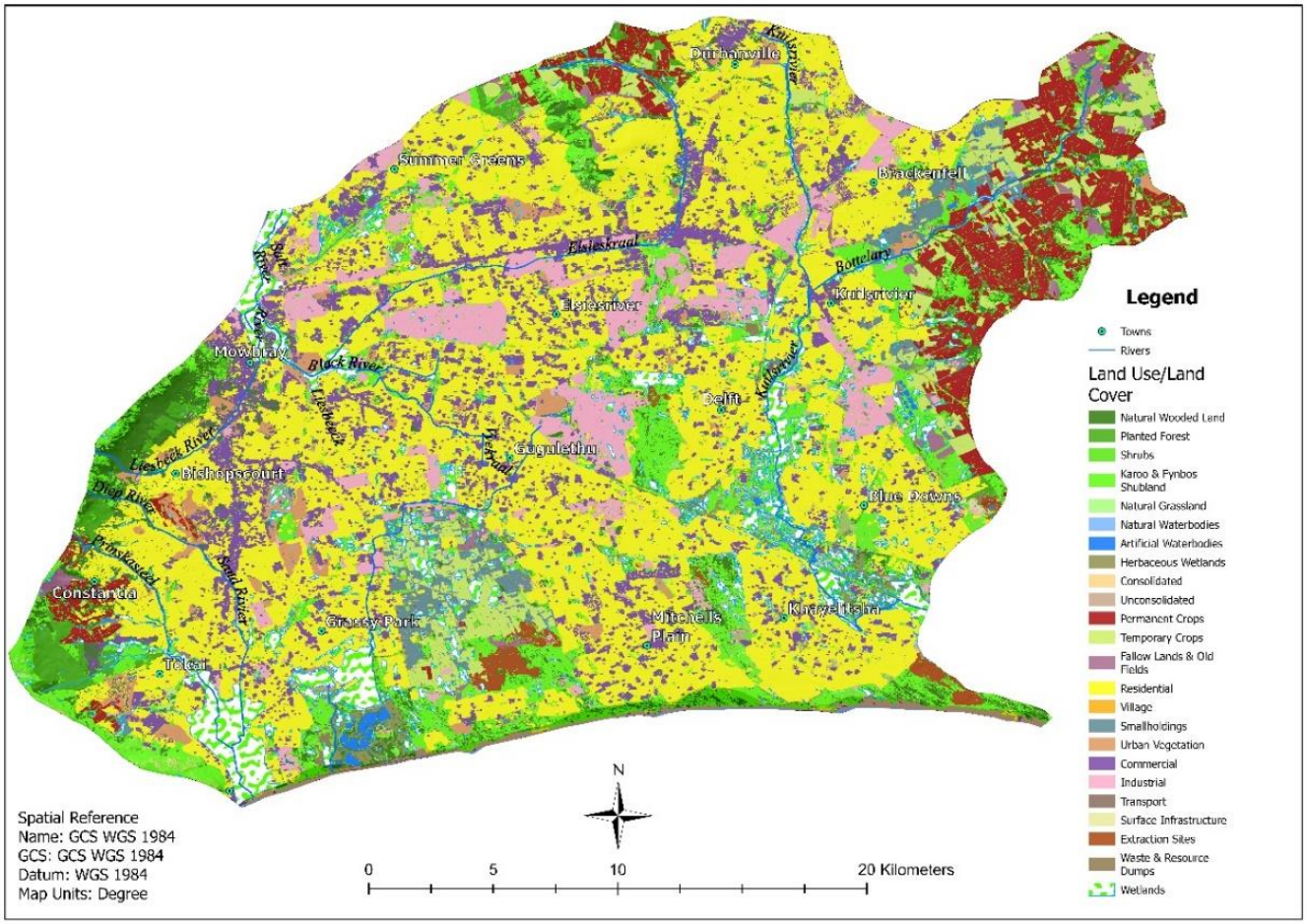

Figure 4: Land use/Land cover map

The Cape Flats land cover classes include woodland, forests, shrubs, water bodies, bare surfaces, residential areas. The catchment area is impacted by land-based activities such as agriculture, informal settlement, waste disposal, and industries, all of which pollute the rivers, wetlands, and aquifer. Different land-based activities have different impacts on the water quantity and quality. Chemicals used in agricultural practices increases the concentration of salt in the surface and groundwater bodies.

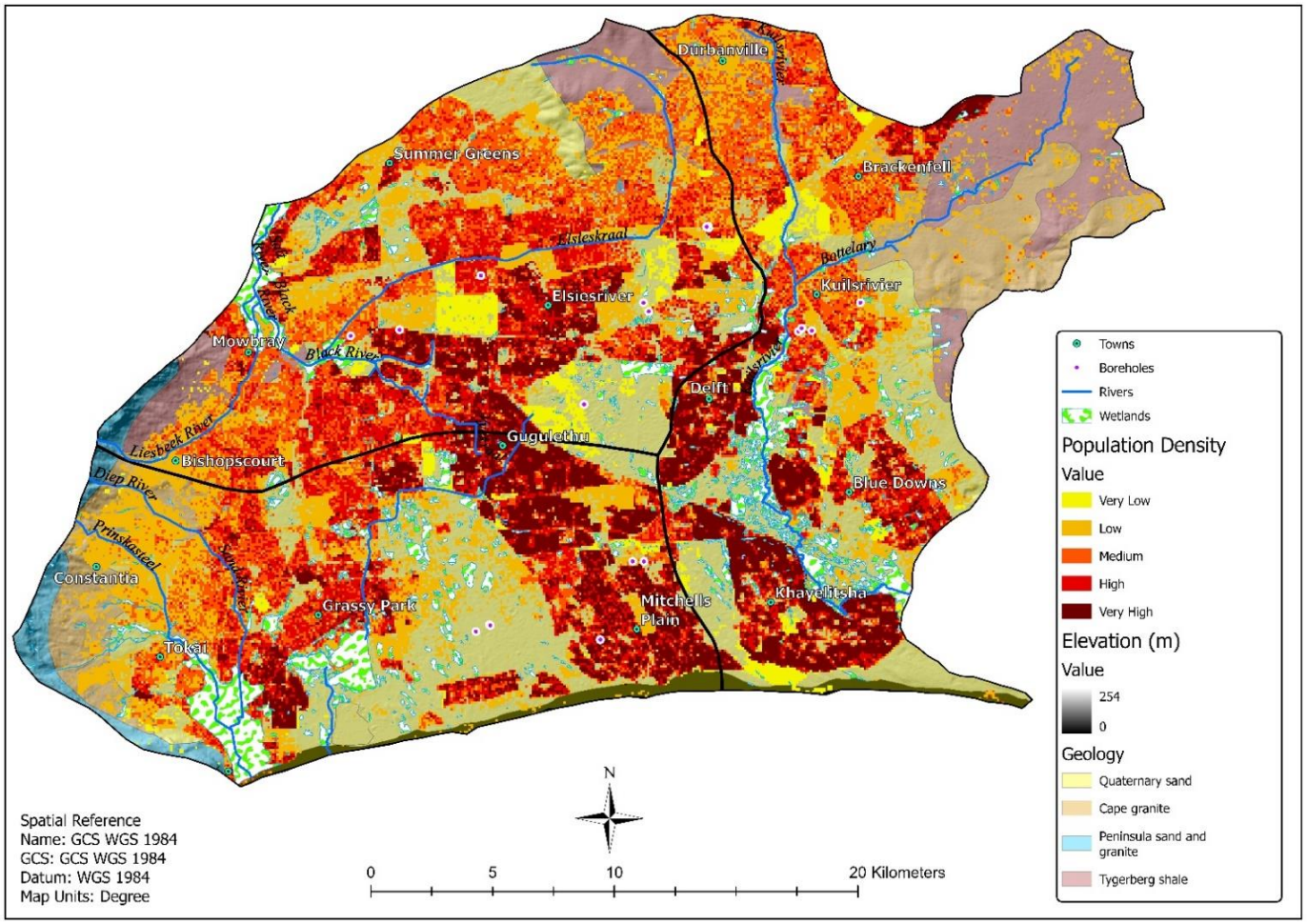

Figure 5: Map showing water features in relation to population density.

Table 3: Summary of impacts, drivers, and mitigation measures

Water Resources	Impact	Driver	Mitigation
Groundwater/ Rivers/ Wetlands	Quantity and Quality	Urban development	Implement effective urban planning strategies, protecting green spaces, wetlands, and natural habitats within urban areas.
	Quantity and Quality	Agriculture; salt concentration, nitrates	Water monitoring and allocation.
	Quantity	Invasive Alien Plants (IAPs): *Eichhornia crassipes* and *Hakea sericea*	Implement invasive species management programs to manage and eradicate invasive alien species
	Quantity	Climate Change (rising temperatures, changing rainfall patterns)	Implement climate change adaptation strategies implementation of green infrastructure measures.
	Quality	Sea-Level Rise (salt water intrusion into freshwater ecosystems)	Implement climate change adaptation strategies implementation of green infrastructure measures.

	Quantity	Overexploitation: overgrazing, illegal sand mining, and the removal of vegetation for fuelwood and building materials.	Engage local communities in conservation efforts through education and awareness programs.
	Quality	Pollution and Contamination (Industrial activities, urban runoff, and inadequate wastewater treatment facilities)	Develop and implement efficient waste management systems, proper waste disposal, waste collection points, recycling facilities.

Closing:

The Cape Flats is an important water management area with vast water resources that needs proper conservation and management efforts. The area faces numerous social and environmental challenges and requires the involvement of all parties operating in the area. Implementing nature-based solutions demands long-term commitment, adequate funding, and collaboration between various stakeholders. By addressing the drivers of ecological infrastructure degradation and implementing these feasible solutions, it is possible to restore and conserve the Cape Flats' ecological infrastructure for the benefit of both the environment and local people.

***The information is subject to change and the document to be updated for better knowledge sharing.**

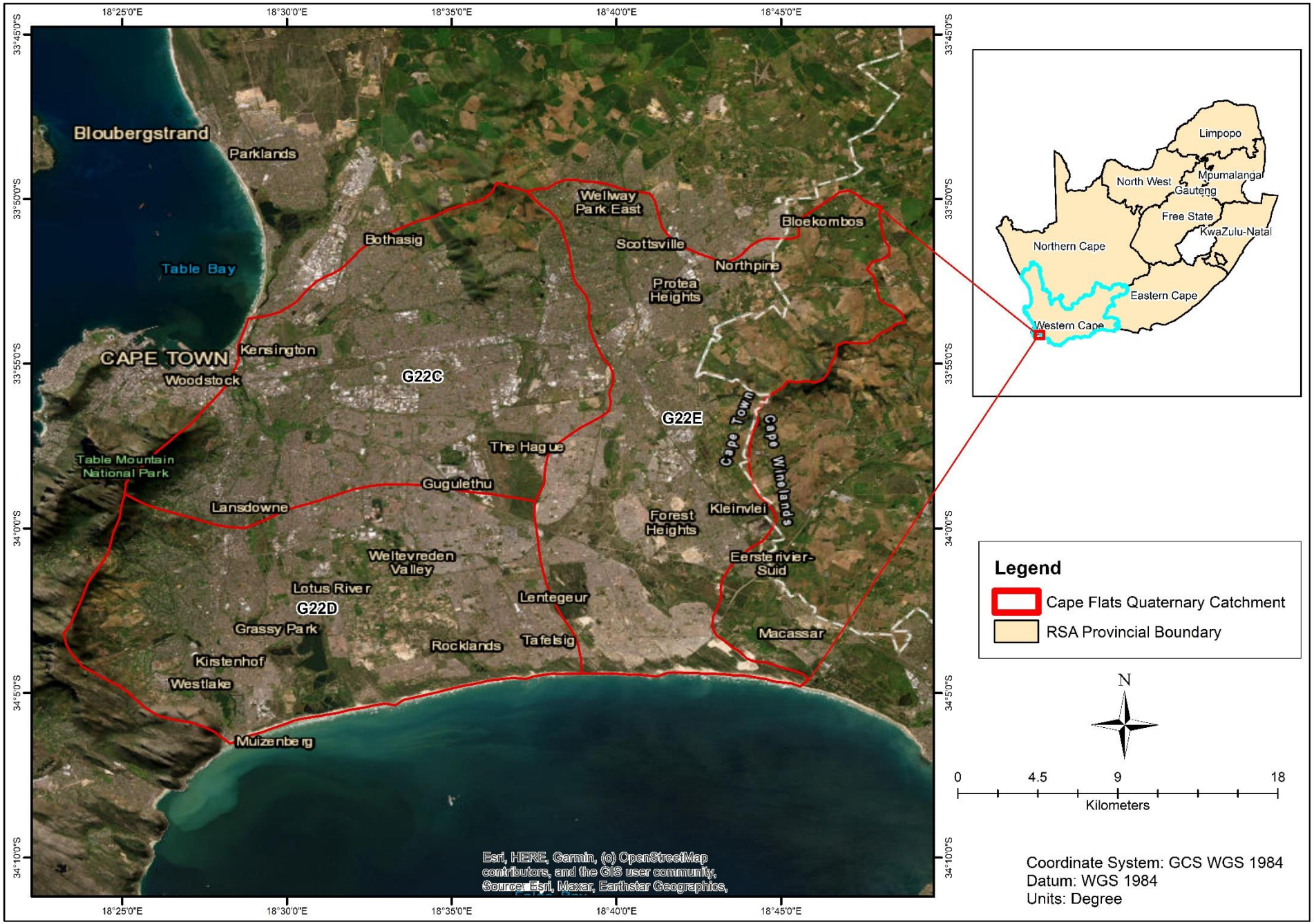
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Table Mountain National Park
The Hague
Gugulethu
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Limpopo
North West
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Gauteng
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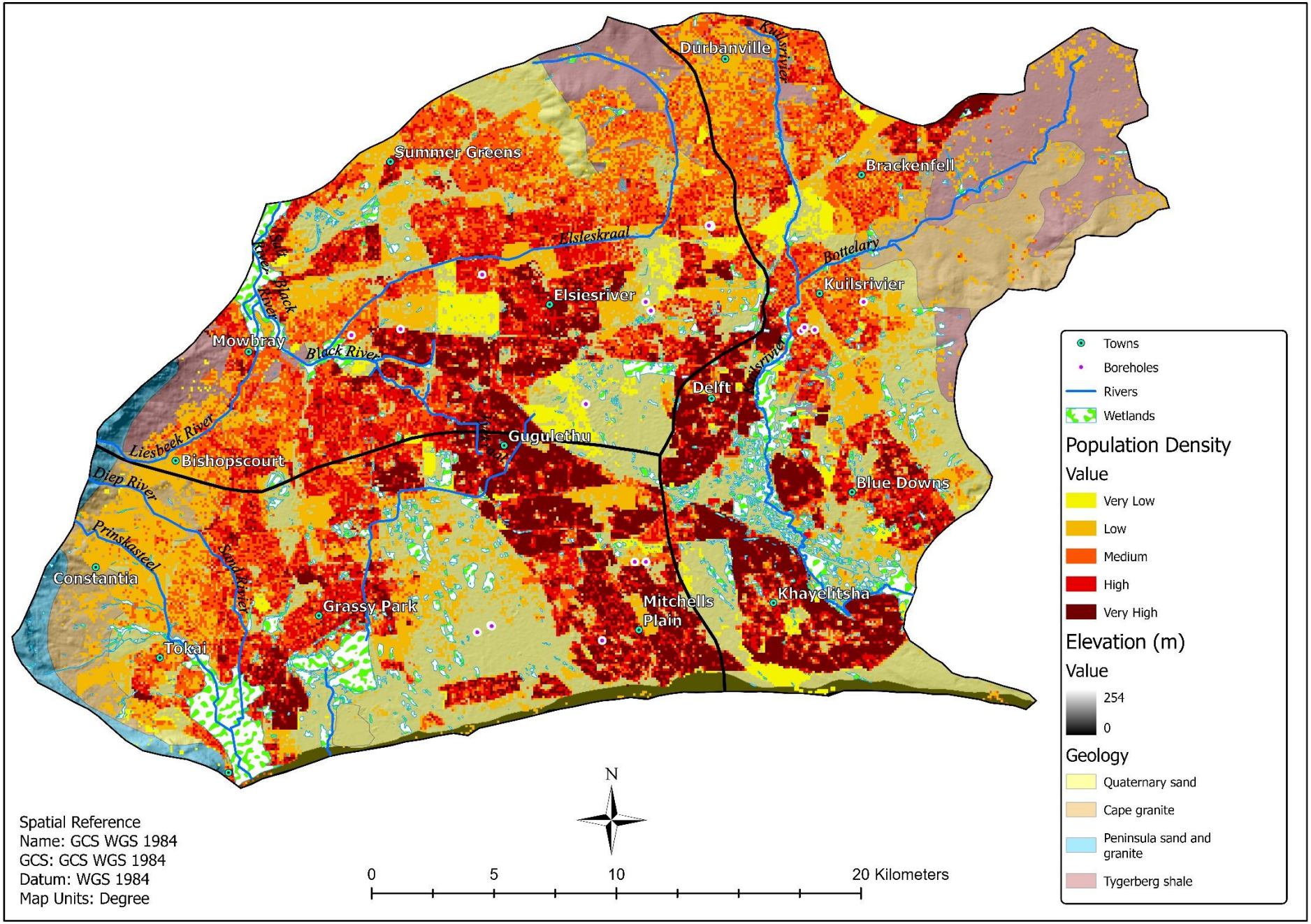
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Delft
Gugulethu
Liesbeek River
Bishopscourt
Diep River
Blue Downs
Prinskasteel
Sand River
Constantia
Grassy Park
Mitchells Plain
Khayelitsha
Tokai
Towns
Boreholes
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Wetlands
Population Density
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Peninsula sand and granite
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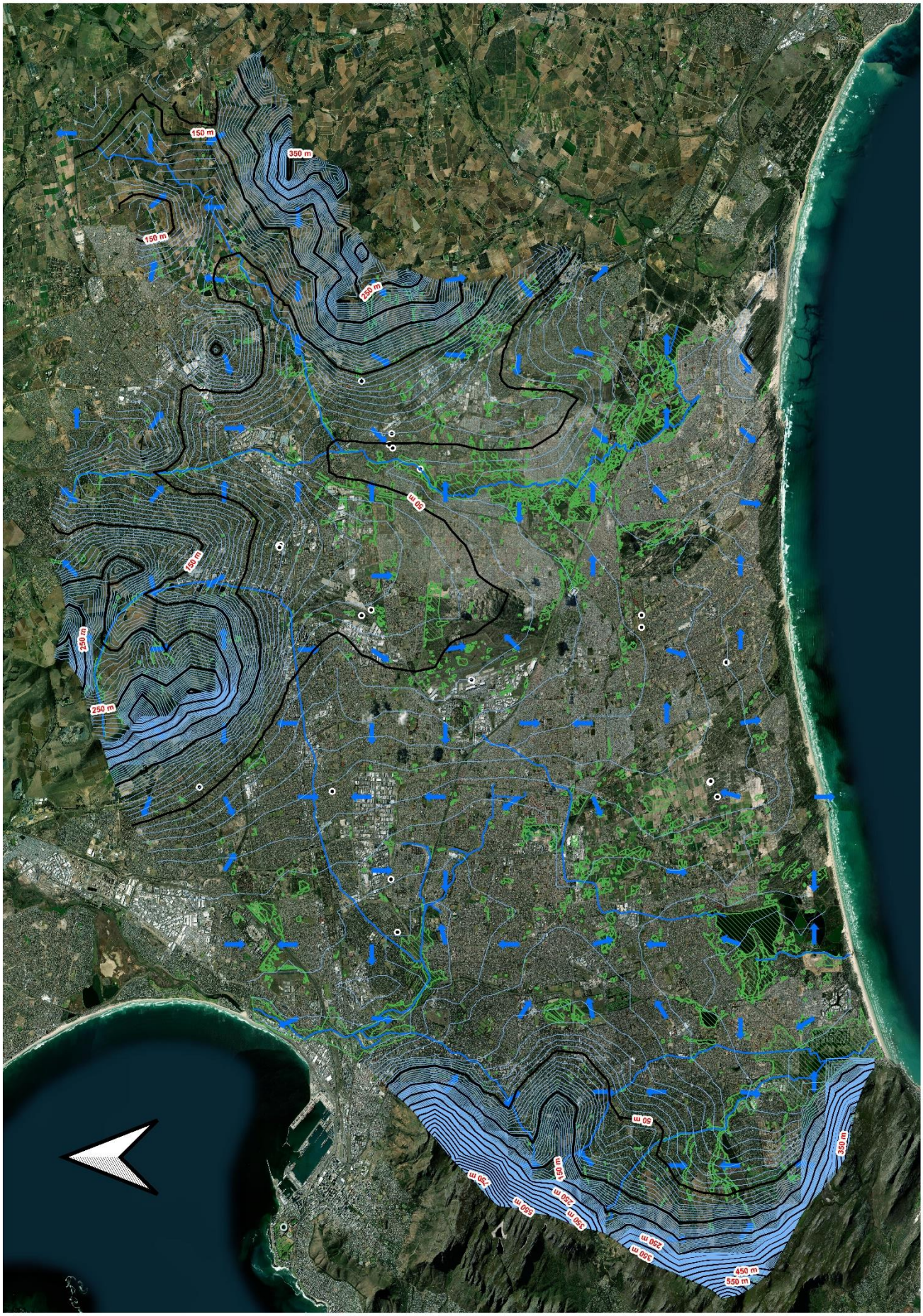
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