

# High Confidence Groundwater Reserve Determination Study for the Berg Catchment

Monitoring Programme – PSC 05

Presented by: Umvoto  
Date: 22 November 2023

WATER IS LIFE - SANITATION IS DIGNITY



**water & sanitation**

Department:  
Water and Sanitation  
**REPUBLIC OF SOUTH AFRICA**



## PRESENTATION OUTLINE

### 1. Monitoring Programme Report

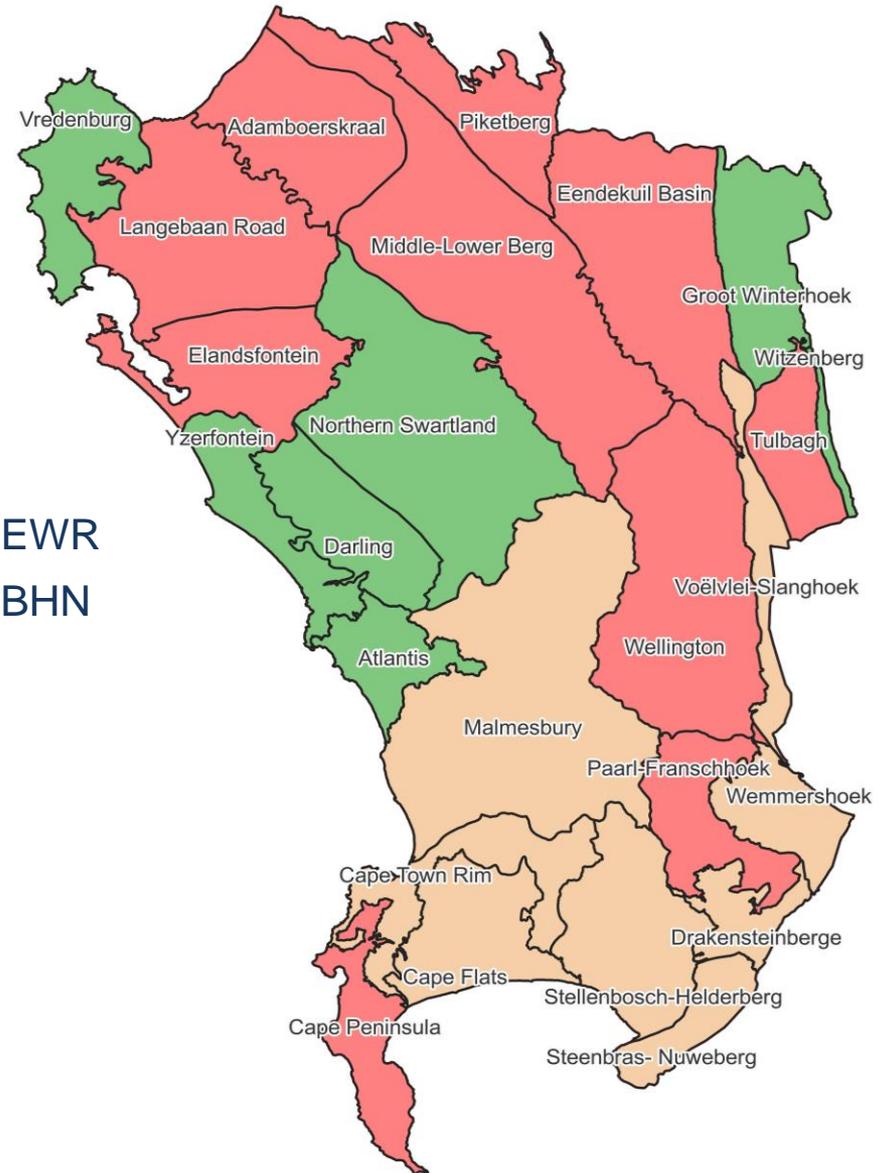
- a) National Policy & IWRM
- b) Assigning Management Options
  - Groundwaters Contribution to EWR
  - Groundwaters Contribution to BHN
- c) Defining Management Objectives
- d) Monitoring Site Selection
- e) Limitations

### 2. Discussion

### 3. Capacity Building Programme

### 4. Management Tasks and Deliverables

### 5. Programme of Upcoming Activities



## SUMMARY OF PROJECT PHASES, TASKS AND DELIVERABLES

| <b>Phase 1</b>  |                               | <b>Project inception</b>                             |   |
|-----------------|-------------------------------|--|---|
| Task 1          | Inception                     |  | Deliverable 1: Inception Report   |
| <b>Phase 2</b>  |                               | <b>Review of water resource information and data</b> |   |
| Task 2.1        | Data collection and collation |  | Deliverable 2.1: Gap Analysis Report<br>Deliverable 2.2: Inventory of Water Resource Models                                 |
| <b>Phase 3</b>  |                               | <b>Reserve determination</b>                         |   |
| Task 3.1        | Step 1                        | Initiate Groundwater Reserve Study                   | Recorded in Deliverable 2.1 and Deliverable 2.2   |
| Task 3.2        | Step 2                        | Water RU Delineation                                 | Deliverable 3.1: Delineation of Water RUs   |
| Task 3.3        | Step 3                        | Ecological Status and Reference Conditions per RU    | Deliverable 3.2: Ecological Reference Conditions  |
| Task 3.4        | Step 4                        | Determine BHN and EWR                                | Deliverable 3.3: BHN and EWR Requirement Report   |
| Task 3.5        | Step 5                        | Operational Scenarios & Socio-economic               | Deliverable 3.4: Operational Scenarios & socio-economic and ecological consequences   |
| Task 3.6        | Step 6                        | Evaluate scenarios with Stakeholders                 | Deliverable 3.5: Stakeholder engagement of operation scenarios  |
| <b>Task 3.7</b> | <b>Step 7</b>                 | <b>Monitoring Programme</b>                          | <b>Deliverables 3.6: Monitoring Programme Report</b>  |
| Task 3.8        | Step 8                        | Gazette & implement Reserve                          | Deliverable 3.7: Groundwater Reserve Determination Report<br>Deliverable 3.8: Database<br>Deliverable 3.9: Gazette Template |

### **STEP 7 GRDM OBJECTIVES**

### **DESIGNING A MONITORING PROGRAMME**

1. Review existing monitoring programmes and assess the spatial distribution of the current monitoring sites to evaluate their alignment with the new monitoring objectives designed to safeguard the groundwater Reserve.
2. Develop a monitoring programme for the Berg catchments groundwater Reserve considering the hydraulic characteristics of the groundwater resource, as well as both the present state and future scenarios of identified groundwater systems.
3. In instances where existing monitoring programs are not implemented or where they are deemed ineffective for maintaining the groundwater Reserve, recommendations will be put forward to the DWS.

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# **NATIONAL POLICY AND IWRM**

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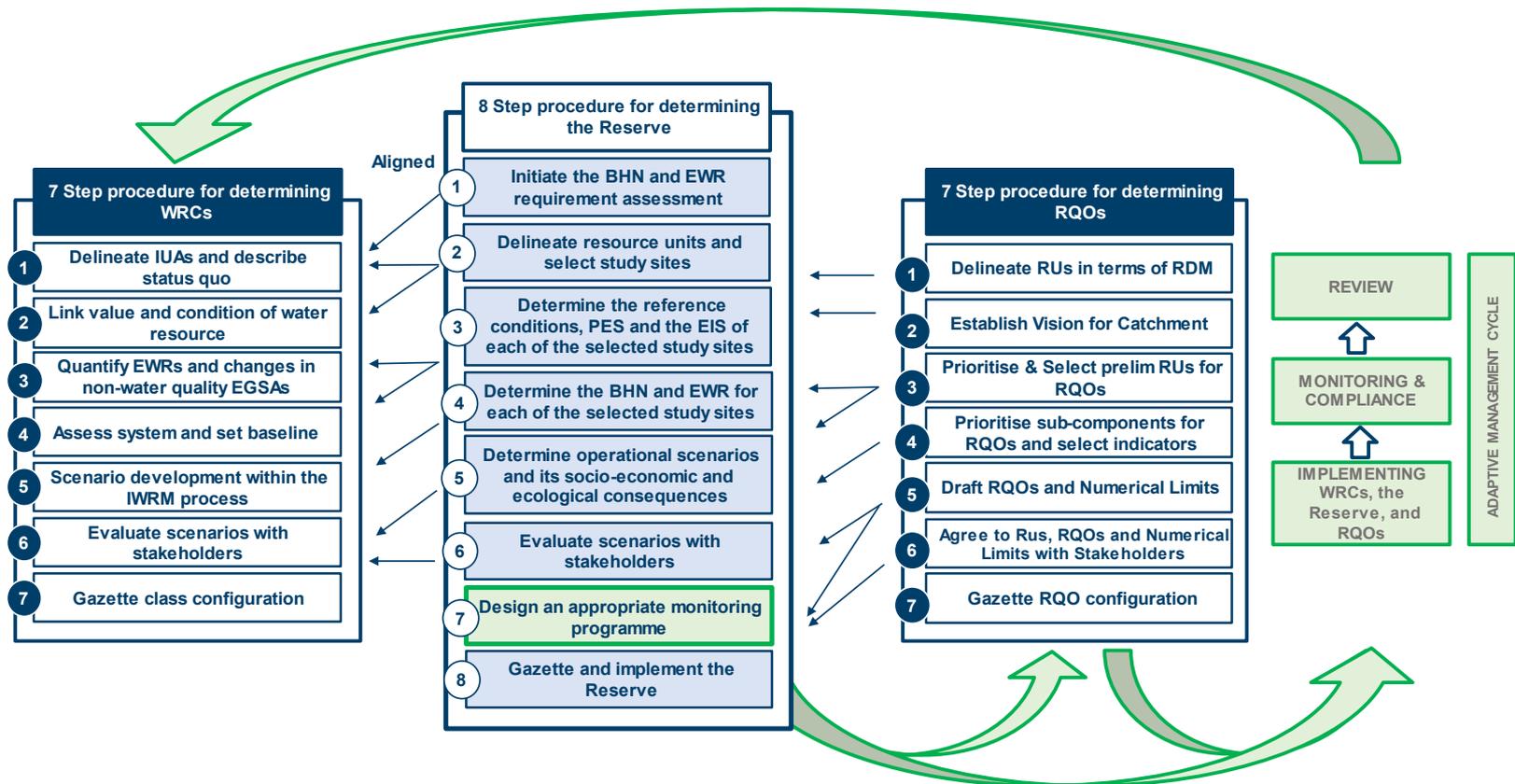
### POLICY OVERVIEW

The Minister of Water and Sanitation serves as the public trustee for water resources and carries the overarching responsibility for all aspects of water resource management. However, to manage these resources effectively, the intention is to **decentralize levels of responsibility to local management authorities over time**. This transition is facilitated by national policies and a regulatory framework provided by various directorates within the DWS.

The Chief Directorate: Water Ecosystems Management (CD: WEM) is responsible for formulating protection strategies, supported by other water management initiatives, that focus on specific compliance interventions. Within the CD: WEM, these protection levels and “vision” for the catchment are defined by **Resource Directed Measures (RDM)**, which include the Classification, the Reserve, and RQOs, and **Source Directed Studies (SDS)**, which pertain to licencing, pollution prevention, remediation, and managing emergency incidents (WRC, 2007).

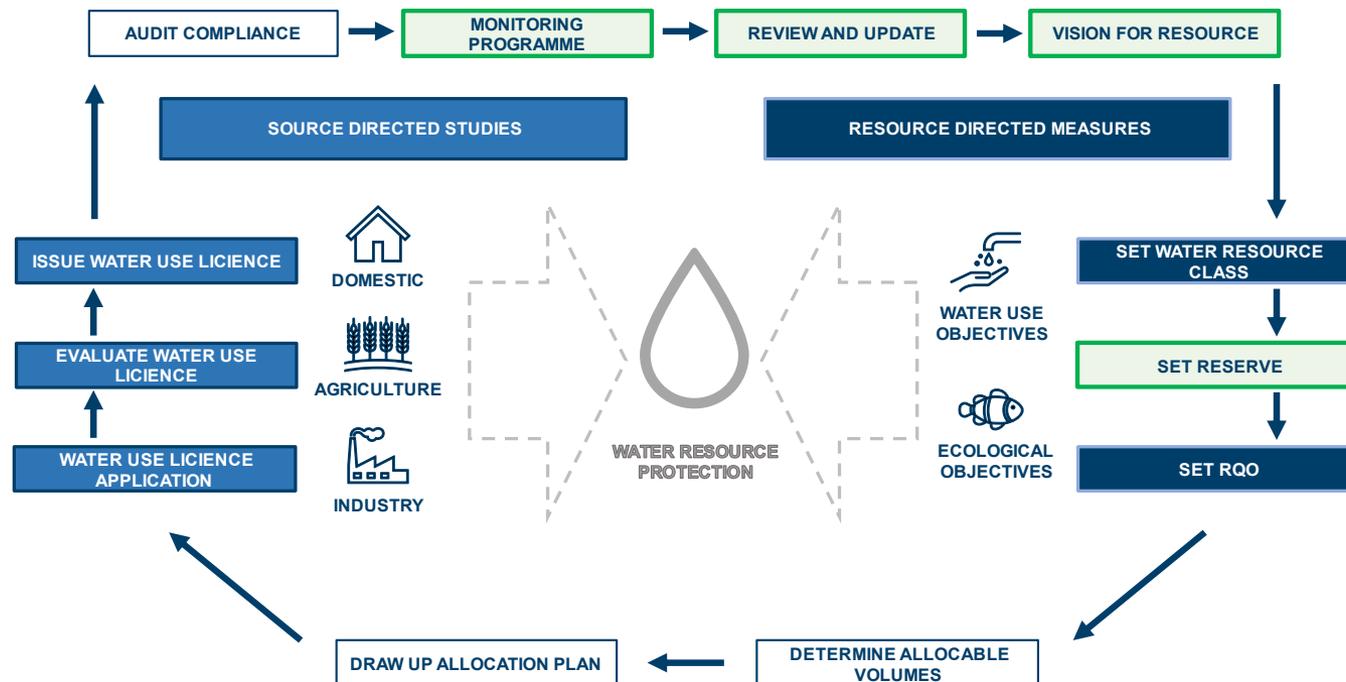
# Monitoring Programme

According to NWA, the Reserve determination process must follow the 8-step procedure outlined in the RDM manuals. The aim of Step 7 is to **develop an appropriate monitoring program** for the Berg catchment specifically related to safeguarding groundwaters contribution to the Reserve (i.e., its **contribution to the EWR and BHN Reserves**).



## INTERGRATED WATER RESOURCE MANAGEMENT

Groundwater monitoring, in the context of the groundwater Reserve, seeks to measure the responses of groundwater systems to various influences, including recharge, discharge, and abstraction. However, multiple other factors, not only those related to RDM and SDS, may affect a single resource, which is presently monitored using only a single set of RQOs. Consequently, various management policies, from different governmental departments or directorates, need to be collated and continually reassessed to incorporate and ensure effective management.



## GROUNDWATER MANAGEMENT LEVELS

Groundwater monitoring in RSA operates at three levels: This multi-tiered approach enables effective and comprehensive groundwater resource management.

- The DWS oversees [national-level monitoring](#), providing a broad perspective on groundwater resources for planning and management, including reference data for assessing GRUs.
- [Regional monitoring](#), conducted by CMAs, offers valuable insights for management (catchment-scale data) within the context of GRDM.
- [Local-level monitoring](#), carried out by water users and relevant entities, collects site-specific data, primarily for compliance assessment with licensing conditions.

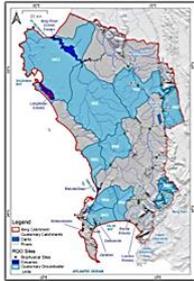
| Level | Management |  | Scientific Focus              |   | Time Frame  |
|-------|------------|--|-------------------------------|---|-------------|
| 1     | National   | DWS  | Referential                   | Countrywide Status of Water Resources   | Long Term   |
| 2     | Regional   | DWS<br>CMA<br>Water Service Authority                            | Proactive or Reactive Control | Response of GRUs and Supporting Systems | Medium Term |
| 3     | Local      | Water User<br>Water Use Association<br>Water Service Institution | Auditing                      | Compliance with WUL Conditions          | Short Term  |

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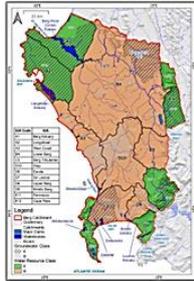
# DEFINING MANAGEMENT OPTIONS

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# WATER RESOURCE COMPONENTS TO CONSIDER



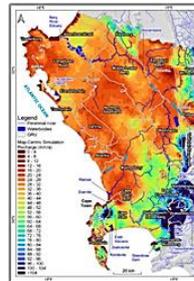
EWR NODES



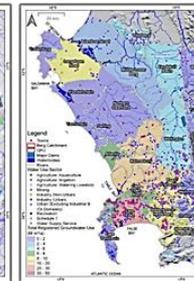
CLASS & IUAs



SWSA & GDEs



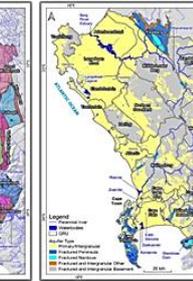
RECHARGE



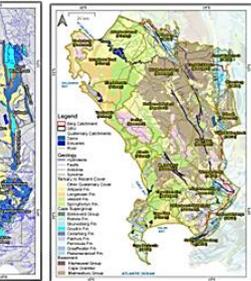
WATER USE



WATER QUALITY



AQUIFER TYPE



GEOLOGY



PRESENT STATUS & AQUIFER STRESS



GW TO BHN



GW TO EWR



MOST LIKELY SCENARIO



GW TO THE RESERVE

**MONITORING  
PROGRAMME**

## MANAGEMENT OPTIONS

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The groundwater Reserve is presented at a GRU scale, comprising of both the BHN and EWR Reserves, each influenced by distinct yet interconnected factors. The criteria for defining a "groundwater management option" at the GRU level should be viewed separately for:

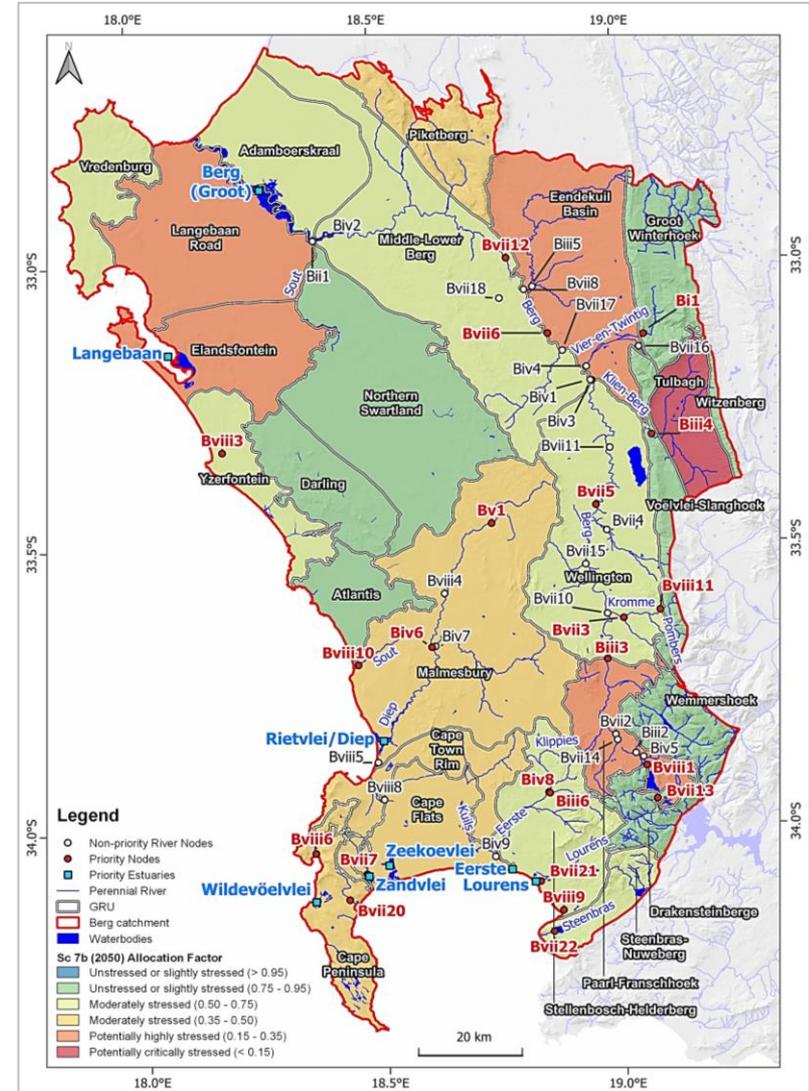
- 1. Groundwater's contribution to the EWR  
(Allocation Factor vs. Baseflow Contribution to EWR Sites)**
- 2. Groundwater's contribution to BHN  
(Groundwater's contribution to the BHN Reserve vs. Population Density)**

# GROUNDWATERS CONTRIBUTION TO THE EWR RESERVE

# MANAGEMENT OPTIONS FOR GROUNDWATERS CONTRIBUTION TO THE EWR RESERVE

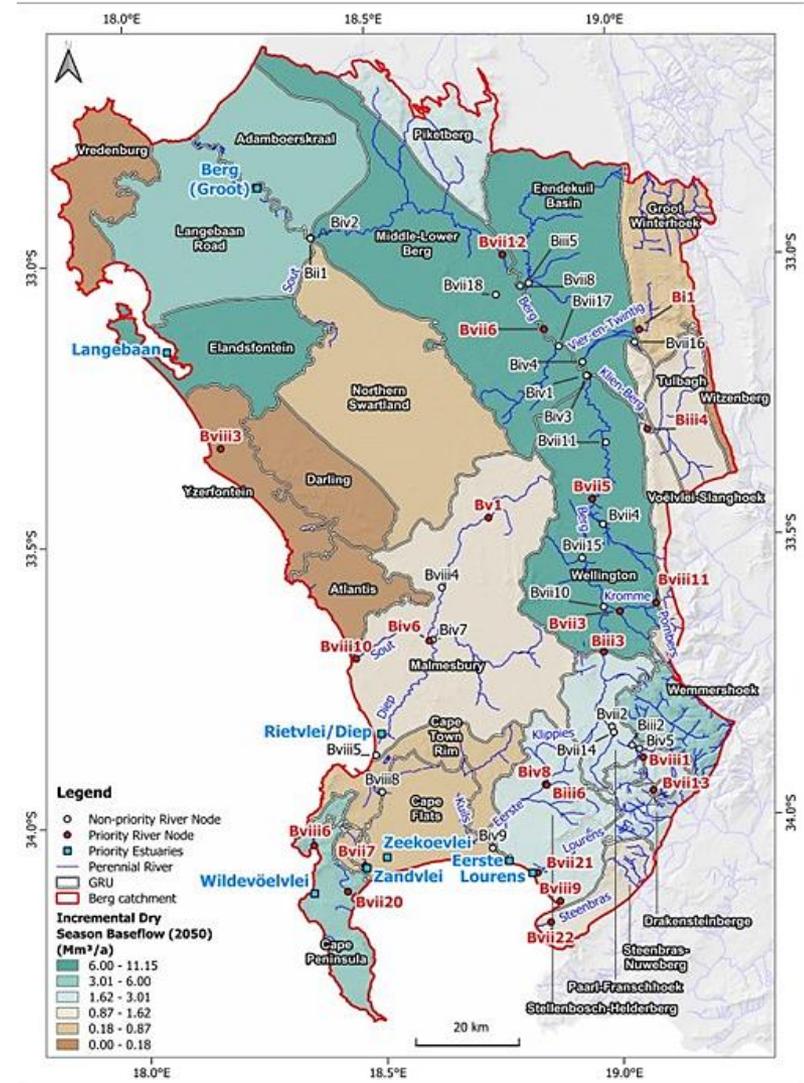
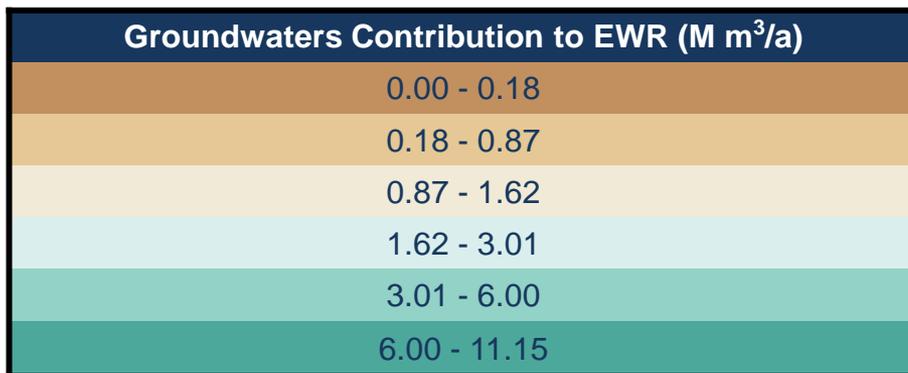
Allocation Factor: Completed as part of Deliverable 3.5 (i.e., SC 07b – Most Likely Future Scenario)

| Allocation Category | Description                     | Allocation Factor |
|---------------------|---------------------------------|-------------------|
| A                   | Unstressed or slightly stressed | >0.95             |
| B                   |                                 | 0.75 - 0.95       |
| C                   |                                 | 0.5 - 0.75        |
| D                   | Moderately stressed             | 0.35 - 0.50       |
| E                   | Potentially highly stressed     | 0.15 - 0.35       |
| F                   | Potentially critically stressed | <0.15             |

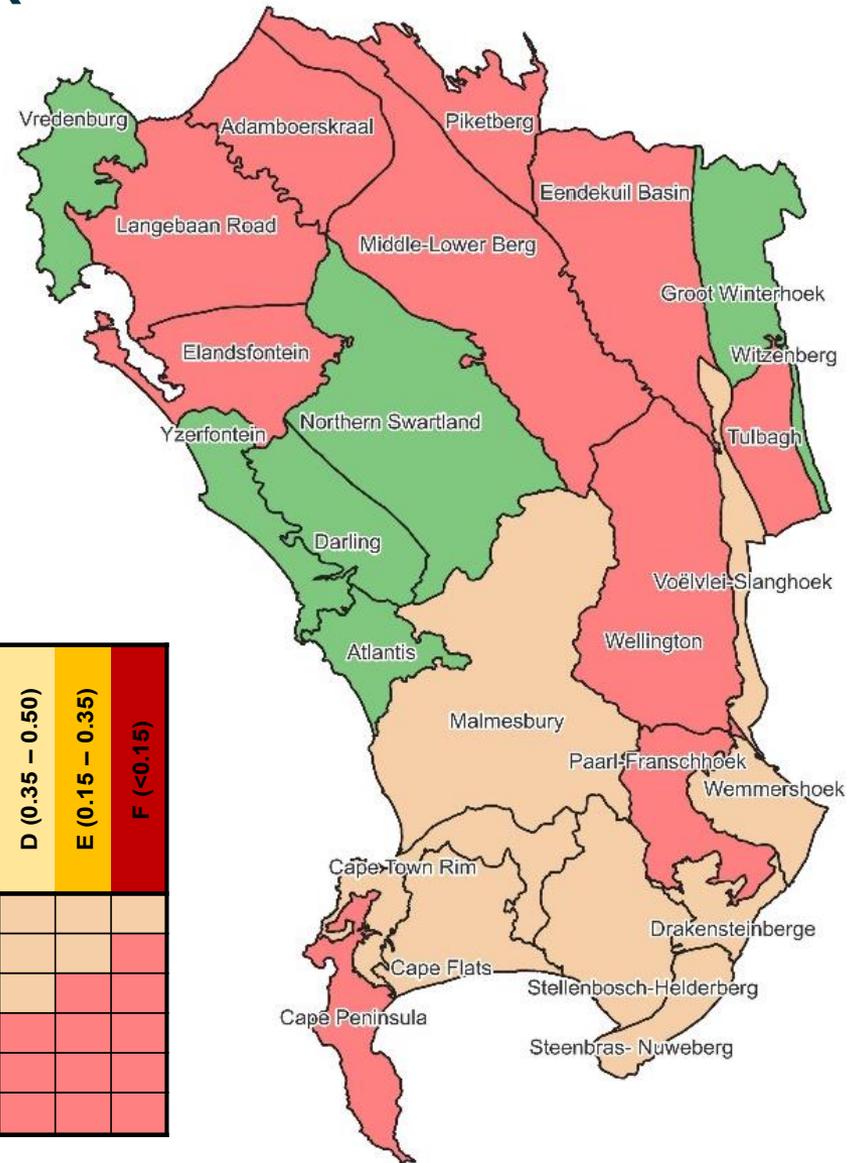
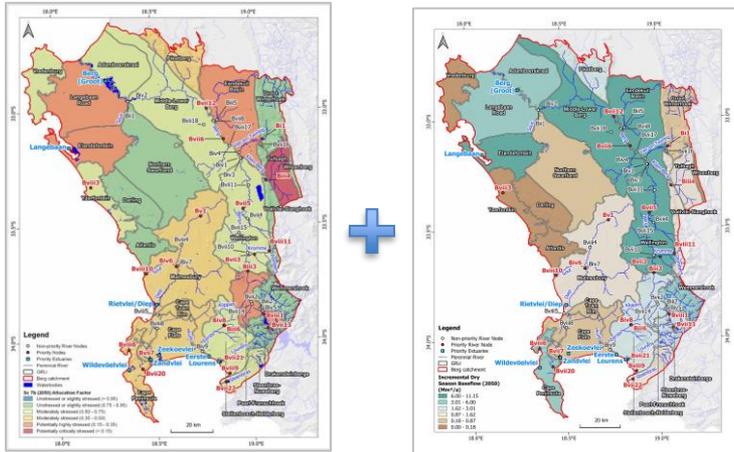


# MANAGEMENT OPTIONS FOR GROUNDWATERS CONTRIBUTION TO THE EWR RESERVE

Baseflow: Groundwaters Contribution to Baseflow, Completed as part of Deliverable 3.5 (i.e., SC 07b – Most Likely Future Scenario)



# MANAGEMENT OPTIONS & MATRIX



| GW Contribution to Baseflow (Mm <sup>3</sup> /a) | Allocation Factor (Still Allocable Volume / Recharge) |                 |                 |                 |                 |           |
|--|---|-----------------|-----------------|-----------------|-----------------|-----------|
|  | A (0.00 - 0.95)                                       | B (0.75 - 0.95) | C (0.50 - 0.75) | D (0.35 - 0.50) | E (0.15 - 0.35) | F (<0.15) |
| 0.00 - 0.18                                      |   |                 |                 |                 |                 |           |
| 0.18 - 0.87                                      |   |                 |                 |                 |                 |           |
| 0.87 - 1.62                                      |   |                 |                 |                 |                 |           |
| 1.62 - 3.01                                      |   |                 |                 |                 |                 |           |
| 3.01 - 6.00                                      |   |                 |                 |                 |                 |           |
| 6.00 - 11.15                                     |   |                 |                 |                 |                 |           |

# MANAGEMENT OPTIONS PER GRU

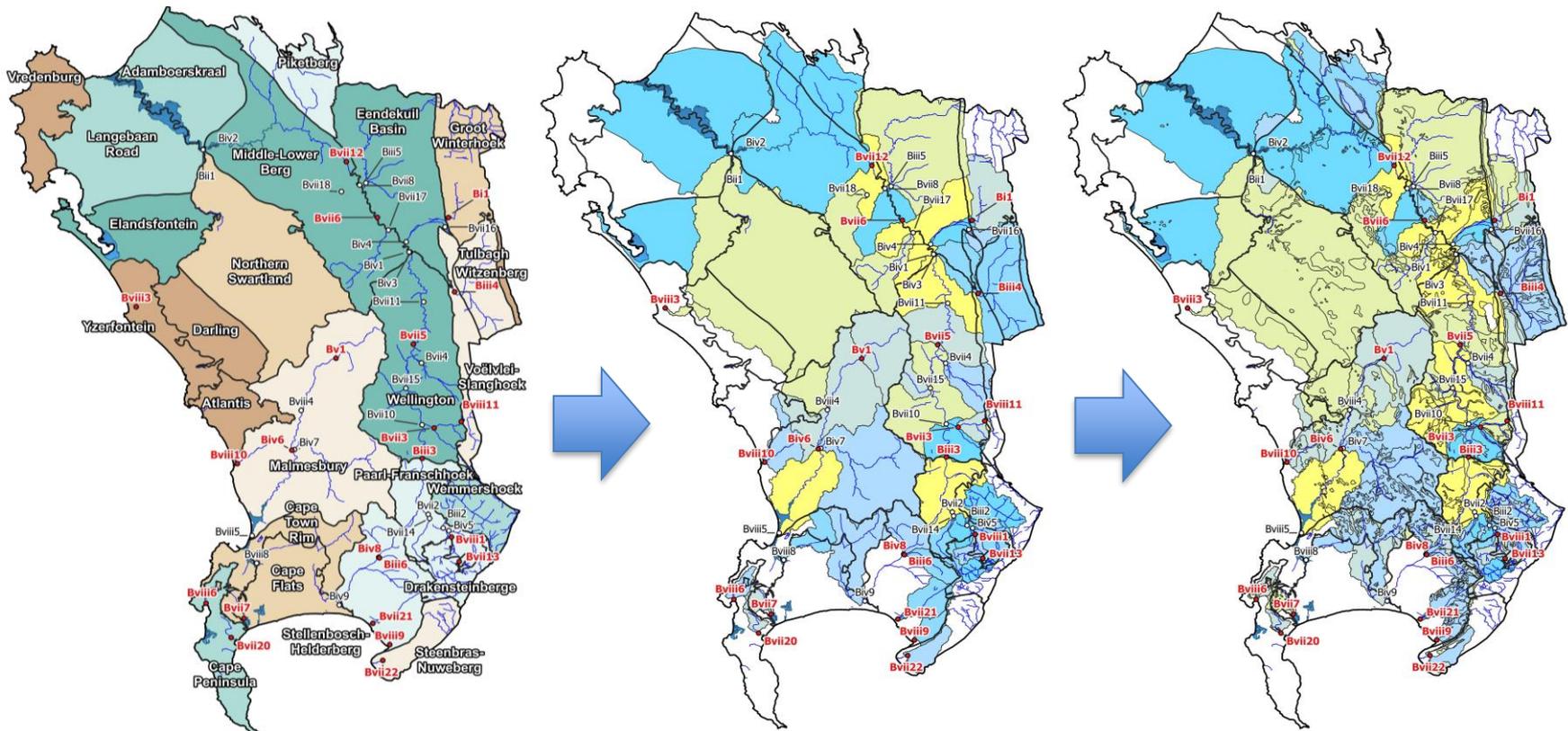
| GRU                     | Allocable Factor per GRU | Groundwaters Contribution to Baseflow per GRU (M m <sup>3</sup> /a) | Groundwaters Contribution to EWR Management Option |
|-------------------------|--------------------------|---|--|
| Adamboerskraal          | 0.53                     | 6.00  | 3  |
| Atlantis                | 0.84                     | 0.08  | 1  |
| Cape Flats              | 0.36                     | 0.51  | 2  |
| Cape Peninsula          | 0.38                     | 5.43  | 3  |
| Cape Town Rim           | 0.39                     | 0.87  | 2  |
| Darling                 | 0.82                     | 0.03  | 1  |
| Drakensteinberge        | 0.85                     | 2.88  | 2  |
| Eendekuil Basin         | 0.21                     | 6.95  | 3  |
| Elandsfontein           | 0.31                     | 6.39  | 3  |
| Groot Winterhoek        | 0.80                     | 0.77  | 1  |
| Langebaan Road          | 0.18                     | 5.52  | 3  |
| Malmesbury              | 0.39                     | 1.18  | 2  |
| Middle-Lower Berg       | 0.56                     | 11.15   | 3  |
| Northern Swartland      | 0.88                     | 0.20  | 1  |
| Paarl-Franschhoek       | 0.24                     | 3.01  | 3  |
| Piketberg               | 0.37                     | 2.07  | 3  |
| Steenbras- Nuweberg     | 0.56                     | 1.16  | 2  |
| Stellenbosch-Helderberg | 0.63                     | 2.34  | 2  |
| Tulbagh                 | 0.14                     | 1.28  | 3  |
| Voëlvllei-Slanghoek     | 0.85                     | 1.62  | 2  |
| Vredenburg              | 0.70                     | 0.00  | 1  |
| Wellington              | 0.52                     | 6.75  | 3  |
| Wemmershoek             | 0.80                     | 3.59  | 2  |
| Witzenberg              | 0.87                     | 0.18  | 1  |
| Yzerfontein             | 0.70                     | 0.02  | 1  |
| <b>TOTAL</b>            |                          | <b>69.98</b>  |  |

| Management Options | Monitoring Description  |
|--------------------|---|
| 1                  | <ul style="list-style-type: none"> <li>• Low Priority</li> <li>• Limited Selection of Monitoring Sites</li> <li>• Infrequent Monitoring</li> </ul>                |
| 2                  | <ul style="list-style-type: none"> <li>• Moderate Priority</li> <li>• Moderate Selection of Monitoring Sites</li> <li>• Increased Monitoring Frequency</li> </ul> |
| 3                  | <ul style="list-style-type: none"> <li>• High Priority</li> <li>• Numerous Selection of Monitoring Sites</li> <li>• High-Frequency Monitoring</li> </ul>          |

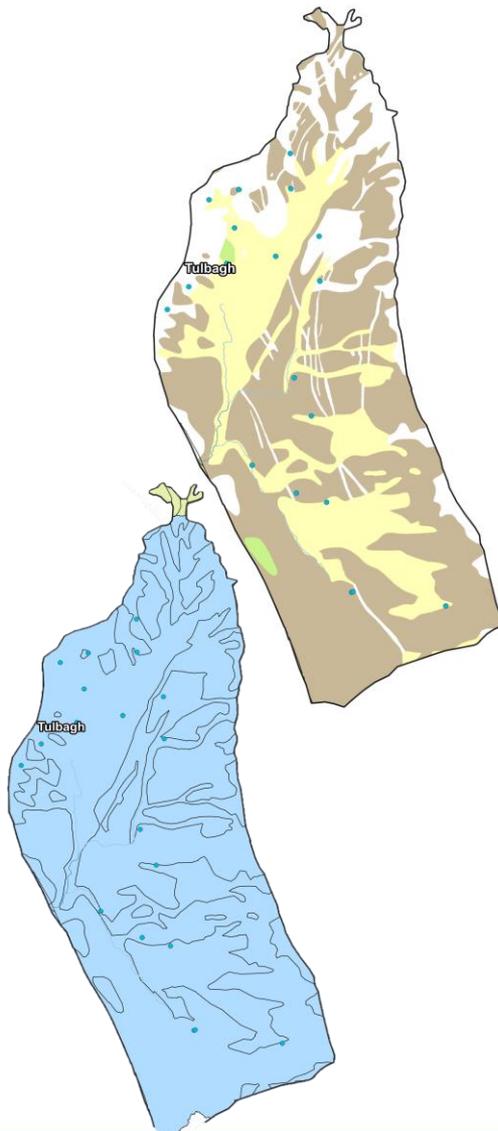
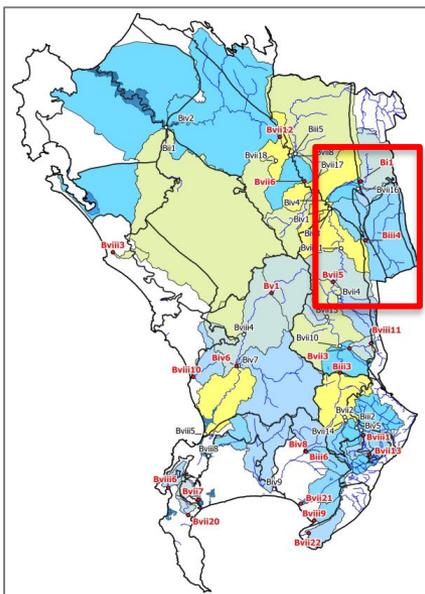
# SITE SELECTION FOR GROUNDWATERS CONTRIBUTION TO THE EWR

NOTE 1: GRUs do not necessarily follow surface water catchment boundaries, so it is necessary to split groundwater contribution to baseflow per catchment by GRU.

NOTE 2: Contribution to baseflow should be aquifer specific.



# Incremental groundwater contribution to baseflow (Mm<sup>3</sup>/a)

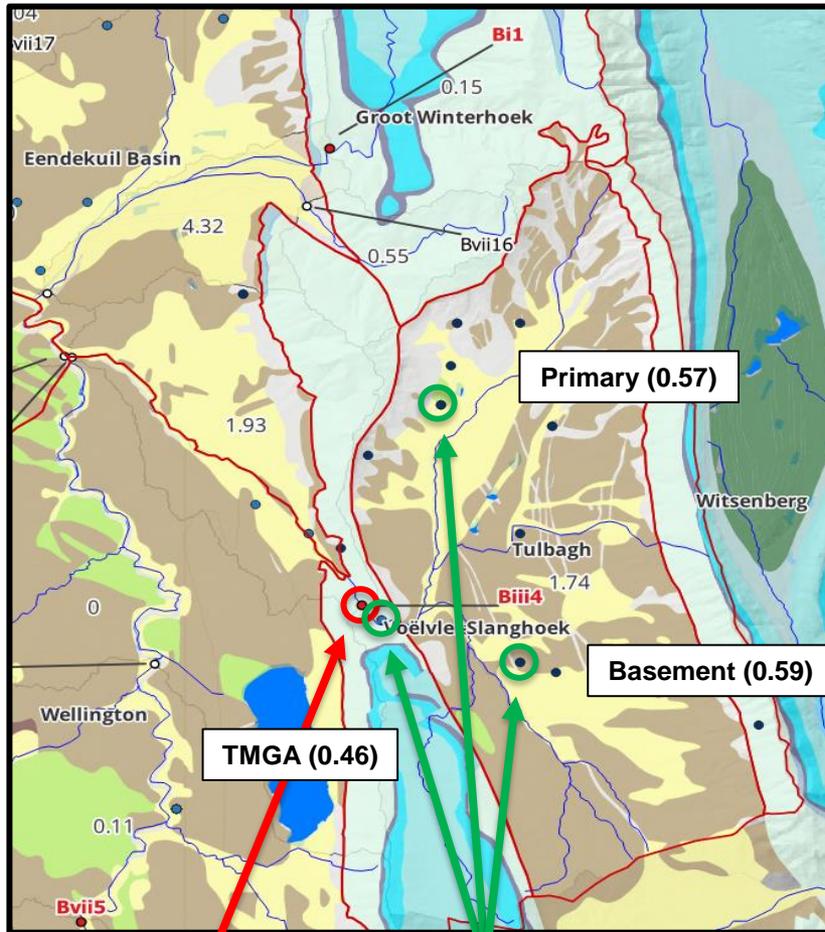


| Node         | Incremental Baseflow |
|--------------|----------------------|
| Bi1          | 0.15                 |
| Bii1         | 0.01                 |
| Biii2        | 3.29                 |
| Biii3        | 0.00                 |
| <b>Biii4</b> | <b>1.74</b>          |
| Biii5        | 0.04                 |
| Biii6        | 0.70                 |

| Node         | Fractured and Intergranular Basement | Nardouw Aquifer | Peninsula Aquifer | Primary/Intergranular | Fractured and Intergranular other |
|--------------|--------------------------------------|-----------------|-------------------|-----------------------|-----------------------------------|
| Bi1          | 1%                                   | 25%             | 51%               | 1%                    | 22%                               |
| Bii1         | 46%                                  | 0%              | 0%                | 54%                   | 0%                                |
| Biii2        | 2%                                   | 10%             | 55%               | 20%                   | 14%                               |
| Biii3        | 30%                                  | 1%              | 14%               | 52%                   | 2%                                |
| <b>Biii4</b> | <b>34%</b>                           | <b>6%</b>       | <b>21%</b>        | <b>33%</b>            | <b>5%</b>                         |
| Biii5        | 83%                                  | 1%              | 7%                | 5%                    | 4%                                |
| Biii6        | 23%                                  | 0%              | 43%               | 33%                   | 1%                                |

| Node         | Fractured and Intergranular Basement | Nardouw Aquifer | Peninsula Aquifer | Primary/Intergranular | Fractured and Intergranular other |
|--------------|--------------------------------------|-----------------|-------------------|-----------------------|-----------------------------------|
| Bi1          | 0.00                                 | 0.04            | 0.08              | 0.00                  | 0.03                              |
| Bii1         | 0.01                                 | 0.00            | 0.00              | 0.01                  | 0.00                              |
| Biii2        | 0.07                                 | 0.33            | 1.81              | 0.66                  | 0.46                              |
| Biii3        | 0.00                                 | 0.00            | 0.00              | 0.00                  | 0.00                              |
| <b>Biii4</b> | <b>0.59</b>                          | <b>0.10</b>     | <b>0.36</b>       | <b>0.57</b>           | <b>0.09</b>                       |
| Biii5        | 0.03                                 | 0.00            | 0.00              | 0.00                  | 0.00                              |
| Biii6        | 0.16                                 | 0.00            | 0.30              | 0.23                  | 0.01                              |

# POTENTIAL MONITORING SITES FOR GROUNDWATERS CONTRIBUTION TO EWR



**EWR Site**

**Potential Monitoring Site**

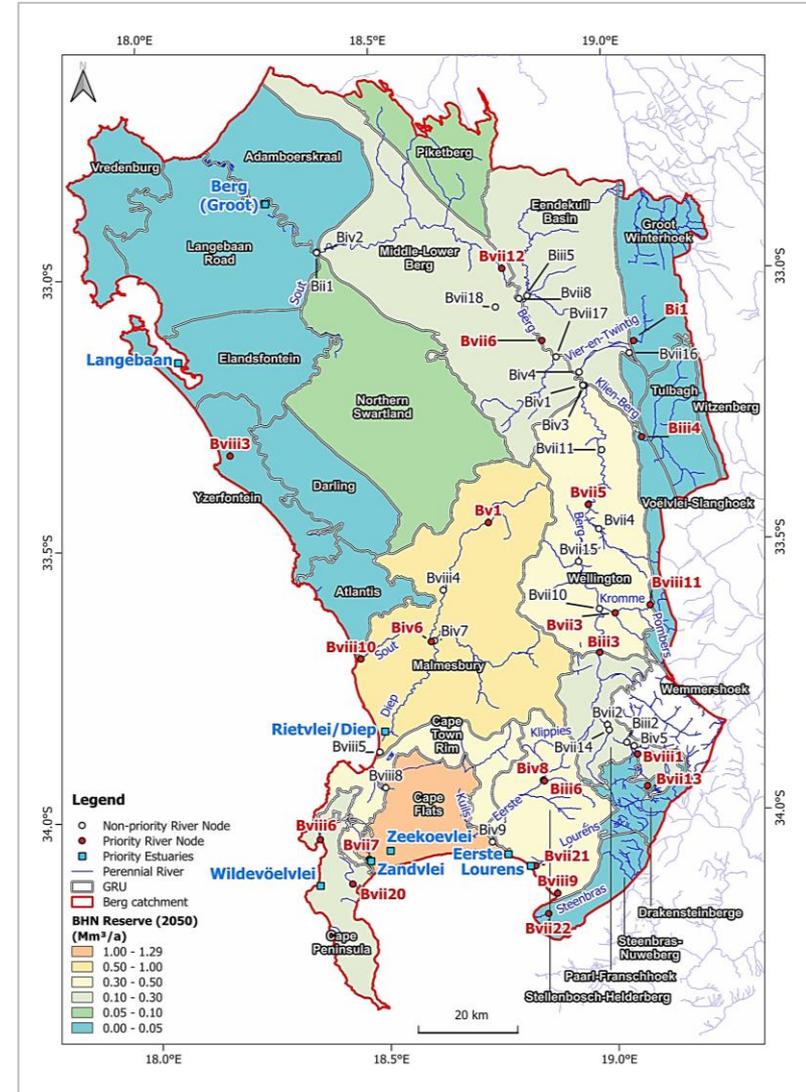
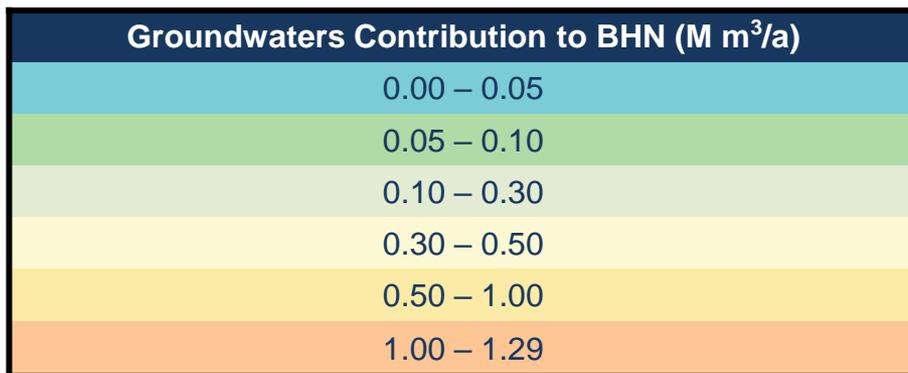
## SITE SELECTION CRITERIA

1. Existing Boreholes (DWS or Private)
2. Proximity to EWR Node
3. Aquifer Specific Unit
4. Location in GRU (i.e., up gradient or down gradient) of EWR Node
5. Expert Opinion

# GROUNDWATERS CONTRIBUTION TO THE BHN RESERVE

# MANAGEMENT OPTIONS FOR GROUNDWATERS CONTRIBUTION TO THE BHN RESERVE

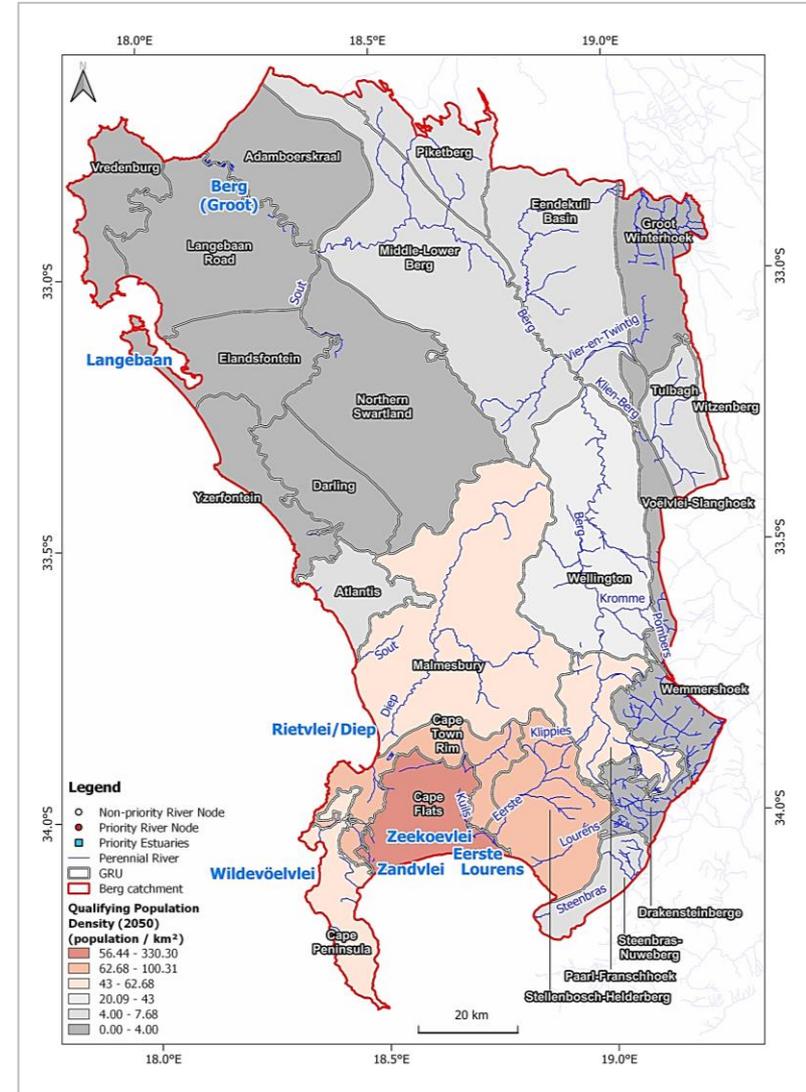
Basic Human Needs: Completed as part of Deliverable 3.5 (i.e., SC 07b – Most Likely Future Scenario)



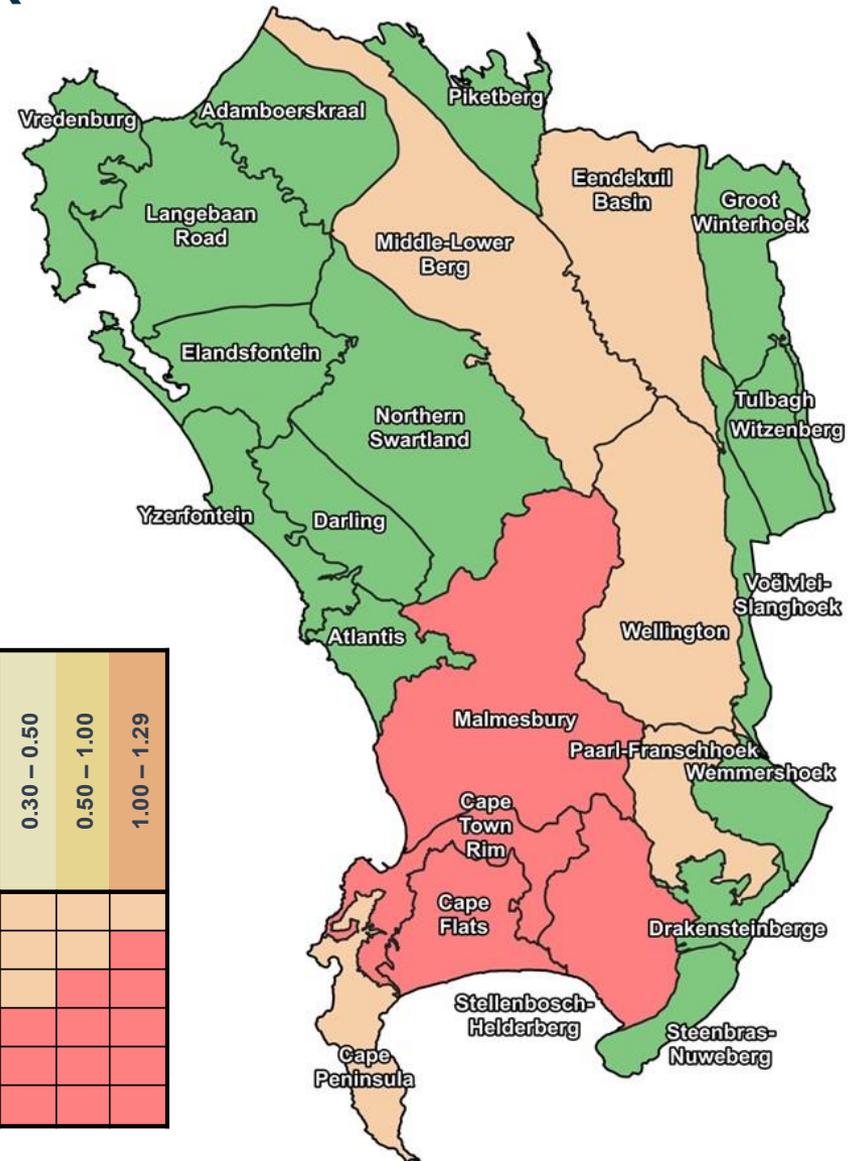
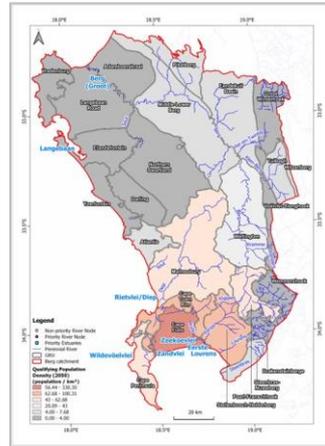
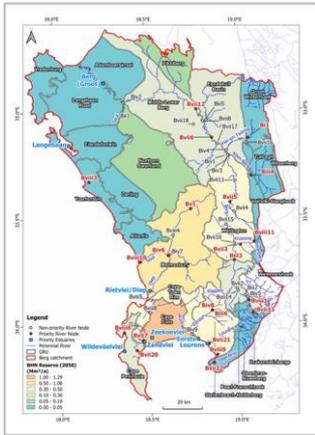
# MANAGEMENT OPTIONS FOR GROUNDWATERS CONTRIBUTION TO THE BHN RESERVE

Qualifying Population Density:  
Completed as part of Deliverable 3.5  
(i.e., SC 07b – Most Likely Future  
Scenario)

| Qualifying Population per km <sup>2</sup> |                 |
|---|-----------------|
|   | 0.00 – 7.29     |
|   | 7.29 – 20.09    |
|   | 20.09 – 43.00   |
|   | 43.00 – 62.68   |
|   | 62.68 – 100.31  |
|   | 100.31 – 329.43 |



# MANAGEMENT OPTIONS & MATRIX



| Population Density (pop/km <sup>2</sup> ) | GW contribution to BHN (Mm <sup>3</sup> /a) |             |             |             |             |             |
|---|---|-------------|-------------|-------------|-------------|-------------|
|   | 0.00 - 0.05                                 | 0.05 - 0.10 | 0.10 - 0.30 | 0.30 - 0.50 | 0.50 - 1.00 | 1.00 - 1.29 |
| 0.00 - 7.29                               | Green                                       | Green       | Green       | Green       | Green       | Green       |
| 7.29 - 20.09                              | Green                                       | Green       | Green       | Green       | Green       | Green       |
| 20.09 - 43.00                             | Green                                       | Green       | Green       | Green       | Green       | Green       |
| 43.00 - 62.68                             | Green                                       | Green       | Green       | Green       | Green       | Green       |
| 62.68 - 100.31                            | Green                                       | Green       | Green       | Green       | Green       | Green       |
| 100.31 - 329.43                           | Green                                       | Green       | Green       | Green       | Green       | Green       |

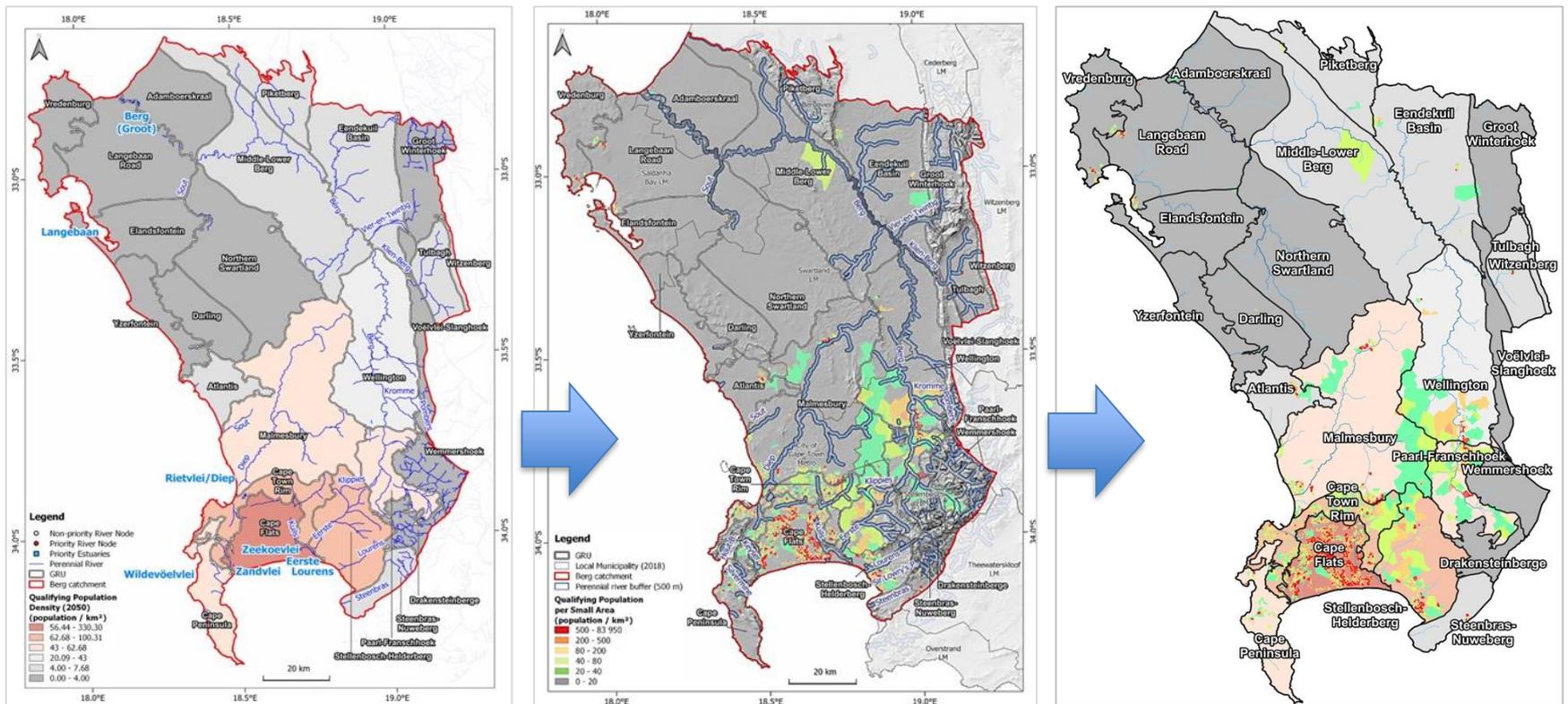
# MANAGEMENT OPTIONS PER GRU

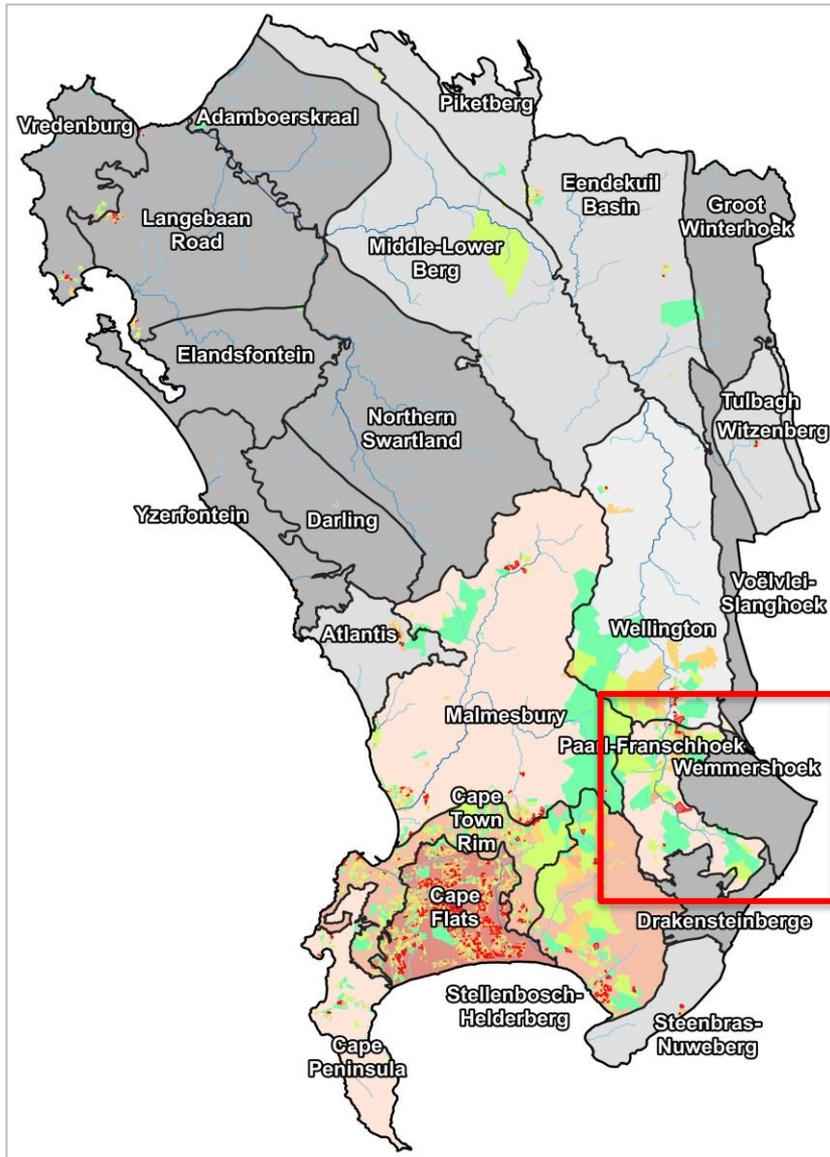
| GRU                     | Groundwaters Contribution to the BHN Reserve (M m <sup>3</sup> /a) | Qualifying Population Density per GRU (pop/km <sup>2</sup> ) | Groundwaters Contribution to BHN Management Option |
|-------------------------|--|--|--|
| Adamboerskraal          | 0.01   | 2.50   | 1  |
| Atlantis                | 0.05   | 20.09  | 1  |
| Cape Flats              | 1.29   | 329.43   | 3  |
| Cape Peninsula          | 0.16   | 56.44  | 2  |
| Cape Town Rim           | 0.36   | 100.31   | 3  |
| Darling                 | 0.03   | 7.72   | 1  |
| Drakensteinberge        | 0.01   | 3.94   | 1  |
| Eendekuil Basin         | 0.16   | 18.16  | 2  |
| Elandsfontein           | 0.01   | 1.97   | 1  |
| Groot Winterhoek        | 0.03   | 7.68   | 1  |
| Langebaan Road          | 0.03   | 4.00   | 1  |
| Malmesbury              | 0.64   | 43.46  | 3  |
| Middle-Lower Berg       | 0.16   | 11.82  | 2  |
| Northern Swartland      | 0.09   | 7.90   | 1  |
| Paarl-Franschhoek       | 0.21   | 62.68  | 2  |
| Piketberg               | 0.06   | 17.57  | 1  |
| Steenbras- Nuweberg     | 0.02   | 13.11  | 1  |
| Stellenbosch-Helderberg | 0.46   | 87.79  | 3  |
| Tulbagh                 | 0.05   | 17.74  | 1  |
| Voëlvlei-Slanghoek      | 0.01   | 6.11   | 1  |
| Vredenburg              | 0.02   | 6.24   | 1  |
| Wellington              | 0.39   | 39.70  | 2  |
| Wemmershoek             | 0.00   | 1.27   | 1  |
| Witzenberg              | 0.00   | 11.22  | 1  |
| Yzerfontein             | 0.02   | 5.84   | 1  |
| <b>TOTAL</b>            | <b>4.27</b>  |  |  |

| Management Options | Monitoring Description  |
|--------------------|---|
| 1                  | <ul style="list-style-type: none"> <li>• Low Priority</li> <li>• Limited Selection of Monitoring Sites</li> <li>• Infrequent Monitoring</li> </ul>                |
| 2                  | <ul style="list-style-type: none"> <li>• Moderate Priority</li> <li>• Moderate Selection of Monitoring Sites</li> <li>• Increased Monitoring Frequency</li> </ul> |
| 3                  | <ul style="list-style-type: none"> <li>• High Priority</li> <li>• Numerous Selection of Monitoring Sites</li> <li>• High-Frequency Monitoring</li> </ul>          |

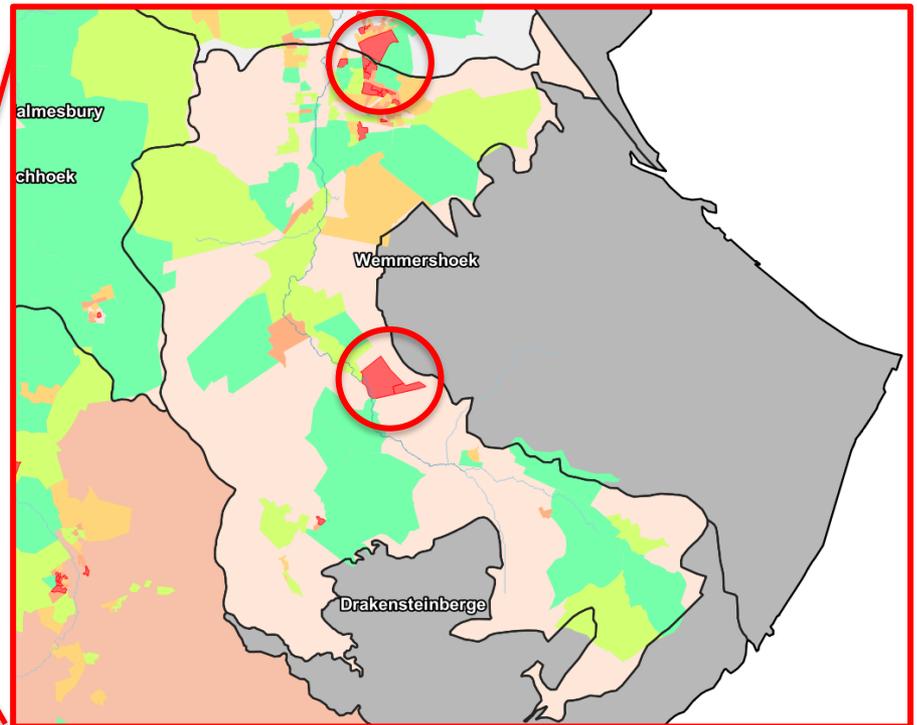
# SITE SELECTION FOR GROUNDWATERS CONTRIBUTION TO BHN

NOTE 1: Qualifying population density varies across GRUs and may not be evenly distributed across the area. For example, there may be small areas with extremely high population density and large areas that are sparsely populated.





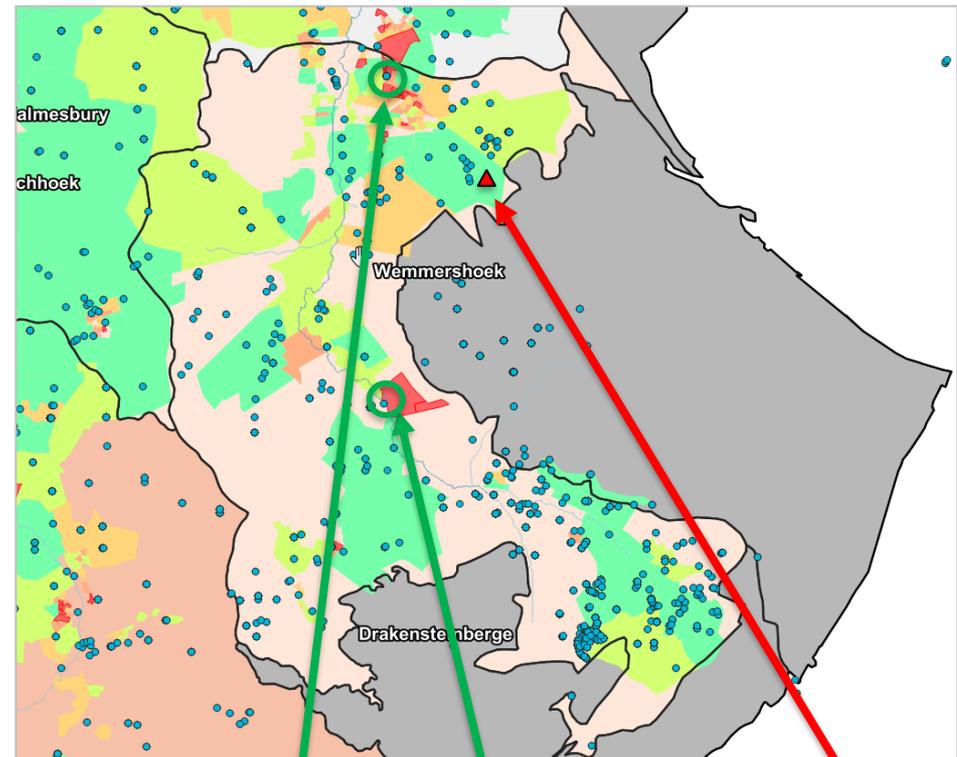
## Population Density per Small Area



# POTENTIAL MONITORING SITES FOR GROUNDWATERS CONTRIBUTION TO BHN

## Site Selection Criteria

1. Existing Site (DWS or Private)
2. Established Water Protection Areas
3. Aquifer Specific Unit
4. Expert opinion



Potential BHN  
Monitoring Site

Background WQ  
Monitoring Site

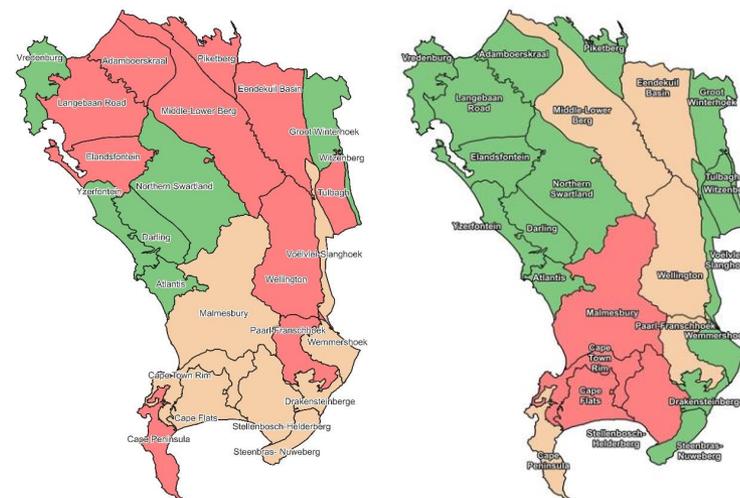
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# DEFINING GROUNDWATER MANGEMENT OBJECTIVES

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# DEFINING GROUNDWATER MANGEMENT OBJECTIVES

| GRU                     | Groundwaters Contribution to EWR Management Option | Groundwaters Contribution to BHN Management Option |
|-------------------------|--|--|
| Adamboerskraal          | 3  | 1  |
| Atlantis                | 1  | 1  |
| Cape Flats              | 2  | 3  |
| Cape Peninsula          | 3  | 2  |
| Cape Town Rim           | 2  | 3  |
| Darling                 | 1  | 1  |
| Drakensteinberge        | 2  | 1  |
| Eendekuil Basin         | 3  | 2  |
| Elandsfontein           | 3  | 1  |
| Groot Winterhoek        | 1  | 1  |
| Langebaan Road          | 3  | 1  |
| Malmesbury              | 2  | 3  |
| Middle-Lower Berg       | 3  | 2  |
| Northern Swartland      | 1  | 1  |
| Paarl-Franschhoek       | 3  | 2  |
| Piketberg               | 3  | 1  |
| Steenbras- Nuweberg     | 2  | 1  |
| Stellenbosch-Helderberg | 2  | 3  |
| Tulbagh                 | 3  | 1  |
| Voëlvlei-Slanghoek      | 2  | 1  |
| Vredenburg              | 1  | 1  |
| Wellington              | 3  | 2  |
| Wemmershoek             | 2  | 1  |
| Witzenberg              | 1  | 1  |
| Yzerfontein             | 1  | 1  |



| Management Options | Monitoring Description  |
|--------------------|---|
| 1                  | <ul style="list-style-type: none"> <li>• Low Priority</li> <li>• Limited Selection of Monitoring Sites</li> <li>• Infrequent Monitoring</li> </ul>                |
| 2                  | <ul style="list-style-type: none"> <li>• Moderate Priority</li> <li>• Moderate Selection of Monitoring Sites</li> <li>• Increased Monitoring Frequency</li> </ul> |
| 3                  | <ul style="list-style-type: none"> <li>• High Priority</li> <li>• Numerous Selection of Monitoring Sites</li> <li>• High-Frequency Monitoring</li> </ul>          |

# Management Options and Monitoring Description

## MANAGEMENT OPTION III

### MONTHLY / QUARTERLY

**Groundwater Levels:**

- Telemetry / Level Logger
- Continuous Daily Records

**Groundwater Quality:**

- Quarterly sampling of the following parameters

**Standard Parameters**

pH, EC, Ca, Mg, Na, K, Palk, MAIk, F, Cl, PO4, SO4

**Site specific additions as per RQO**

Nutrients, Salts, Toxins, Pathogens, System Variables, etc.

**Site specific additions of nutrients (BHN/EWR)**

NO2, NO3, NH4

**Site specific additions as per BHN (microbiological)**

E coli, Total Coliforms, Fecal Coliforms

## MANAGEMENT OPTION II

### QUARTERLY

**Groundwater Levels:**

- Level logger at selected sites
- Manual measurement at all sites
- Monthly / Quarterly Records

**Groundwater Quality:**

- Quarterly sampling of the following parameters

**Standard Parameters**

pH, EC, Ca, Mg, Na, K, Palk, MAIk, F, Cl, PO4, SO4

**Site specific additions as per RQO**

Nutrients, Salts, Toxins, Pathogens, System Variables, etc.

**Site specific additions of nutrients (BHN/EWR)**

NO2, NO3, NH4

**Site specific additions as per BHN (microbiological)**

E coli, Total Coliforms, Fecal Coliforms

## MANAGEMENT OPTION I

### BI ANNUALY

**Groundwater Levels:**

- Manual Measurement at selected sites
- Quarterly / Bi Annual Records

**Groundwater Quality:**

- Biannual sampling of the following parameters (summer & winter)

**Standard Parameters**

pH, EC, Ca, Mg, Na, K, Palk, MAIk, F, Cl, PO4, SO4

**Site specific additions as per RQO**

Nutrients, Salts, Toxins, Pathogens, System Variables, etc.

**Site specific additions of nutrients (BHN/EWR)**

NO2, NO3, NH4

**Site specific additions as per BHN (microbiological)**

E coli, Total Coliforms, Fecal Coliforms

# LIMITATIONS

Note: It is important to appreciate that this procedure has certain limitations, these include:

1. The monitoring programme is not determined for individual users, but rather for the Berg Catchment as a whole.
2. The Reserve Limits and associated RQOs do not replace the need for other monitoring programmes. Individual users and developments are still required to have their own monitoring programmes and should ensure that the data is shared with DWS to supplement their monitoring programme.

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# **CAPACITY BUILDING PROGRAMME**

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## CAPACITY BUILDING PROGRAMME

| Task | Description   | Period       | Status   |
|------|---|--------------|----------|
| 2.1  | Gap Analysis and Water Resource Model Inventory: data collection, review, and analysis  | June 2022    | Complete |
| 3.1  | GRU delineation   | August 2022  | Complete |
| 3.4  | Water Resource Modelling: 1 week groundwater modelling training.  | January 2023 | Complete |
| 3.8  | Reserve Determination: Stakeholder Engagement Workshop and provide inputs to the Predictive Scenarios (and associated methodology) used to develop the most likely future scenario for the catchment. | August 2023  | Complete |

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# **MANAGEMENT TASKS AND DELIVERABLES**

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# PROJECT PROGRESS STATUS

| 2022  |     |     |                                      |   |  |   |                                      |                                      |     | 2023                                 |                                      |                                      |                                      |     |     |     |     |     |     | 2024 |     |     |     |
|---|-----|-----|--------------------------------------|---|--|---|--------------------------------------|--------------------------------------|-----|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|
| Mar   | Apr | May | Jun                                  | Jul   | Aug  | Sep   | Oct                                  | Nov                                  | Dec | Jan                                  | Feb                                  | Mar                                  | Apr                                  | May | Jun | Jul | Aug | Sep | Oct | Nov  | Dec | Jan | Feb |
|   |     |     | <b>DATA COLLECTION AND COLLATION</b> |   |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     | X                                    | Reporting ( <b>Deliverable 2.1</b> )              |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     | X                                    | Reporting ( <b>Deliverable 2.2</b> )              |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      | <b>STEP 1: INITIATE GROUNDWATER RESERVE STUDY</b> |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   | <b>STEP 2: WATER RESOURCE UNIT DELINEATION</b> |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   | X  | Reporting ( <b>Deliverable 3.1</b> )                      |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  | <b>STEP 3: ECOLOGICAL STATUS AND REFERENCE CONDITIONS</b> |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  | X   | Reporting ( <b>Deliverable 3.2</b> ) |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  |   | <b>STEP 4: DETERMINE BHN AND EWR</b> |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  |   | X                                    | Reporting ( <b>Deliverable 3.3</b> ) |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
| <b>STEP 5: OPERATIONAL SCENARIOS AND SOCIO-ECONOMIC</b> |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  |   |                                      |                                      |     | Reporting ( <b>Deliverable 3.4</b> ) |                                      |                                      |                                      |     |     |     |     |     |     |      |     | X   |     |
| <b>STEP 6: EVALUATE SCENARIOS WITH STAKEHOLDERS</b>     |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  |   |                                      |                                      |     |                                      | Reporting ( <b>Deliverable 3.5</b> ) |                                      |                                      |     |     |     |     |     |     |      |     | X   |     |
| <b>STEP 7: MONITORING PROGRAMME</b>                     |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      | Reporting ( <b>Deliverable 3.6</b> ) |                                      |     |     |     |     |     |     |      |     | X   |     |
| <b>STEP 8: GAZETTE AND IMPLEMENT RESERVE</b>            |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      |                                      |     |     |     |     |     |     |      |     |     |     |
|   |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      | Reporting ( <b>Deliverable 3.7</b> ) |     |     |     |     |     |     |      |     | X   |     |
|   |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      | Database ( <b>Deliverable 3.8</b> )  |     |     |     |     |     |     |      |     | X   |     |
|   |     |     |                                      |   |  |   |                                      |                                      |     |                                      |                                      |                                      | Reporting ( <b>Deliverable 3.9</b> ) |     |     |     |     |     |     |      |     | X   |     |

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# **PROGRAMME OF UPCOMING EVENTS**

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# PROGREAMME OF UPCOMING EVENTS

## November 2023

- **Management:**

1. Project Stakeholder Committee Meeting (PSC 05) held in mid-November 2023

- **Deliverable:**

1. Monitoring Programme Report Final Draft (D3.7)

## December 2023

- **Tasks:**

1. Task 3.8: Gazette & Implementation of the Reserve

- **Deliverable:**

1. Groundwater Reserve Determination Progress Report (D3.7)

**THANK YOU**