

Appendix 1:

Theoretical artificial recharge potential per water management area

The method for establishing the artificial recharge areas and potential storage volumes is described in Section B.4.

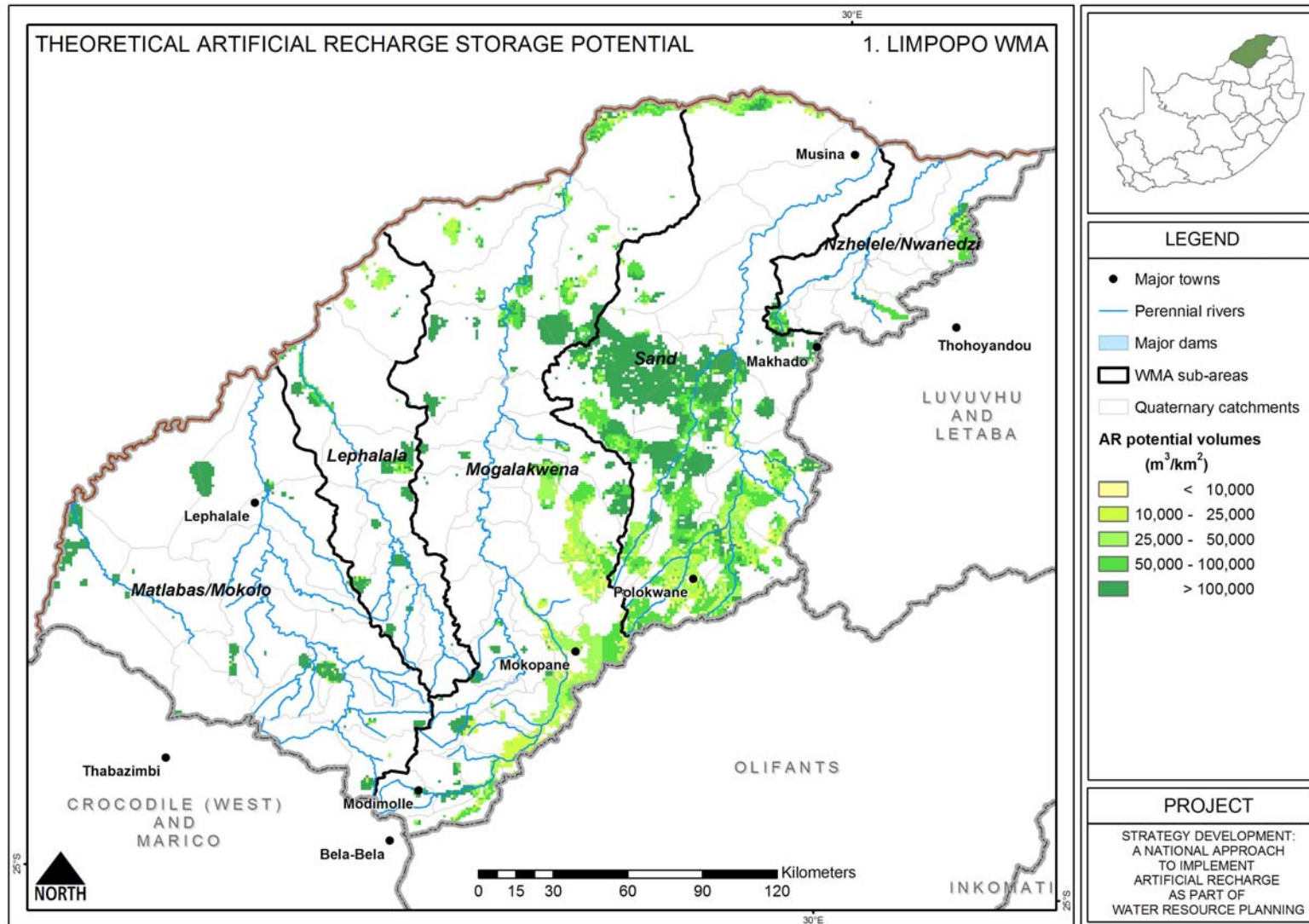
Water Management Area 1: Limpopo

WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
1 Limpopo	Matlabas/Mokolo	382	76		46	63	124	232	356
	Lephalala	150	17		42	42	61	91	152
	Mogalakwena	269	41		72	79	172	273	445
	Sand	72	10		91	106	277	540	817
	Nzhelele/Nwanedzi	113	12		30	32	18	28	46
	Total for WMA1	986	156	319	281	322	652	1163	1815

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* Derived from GRAII data sets (refer to Section B.4)



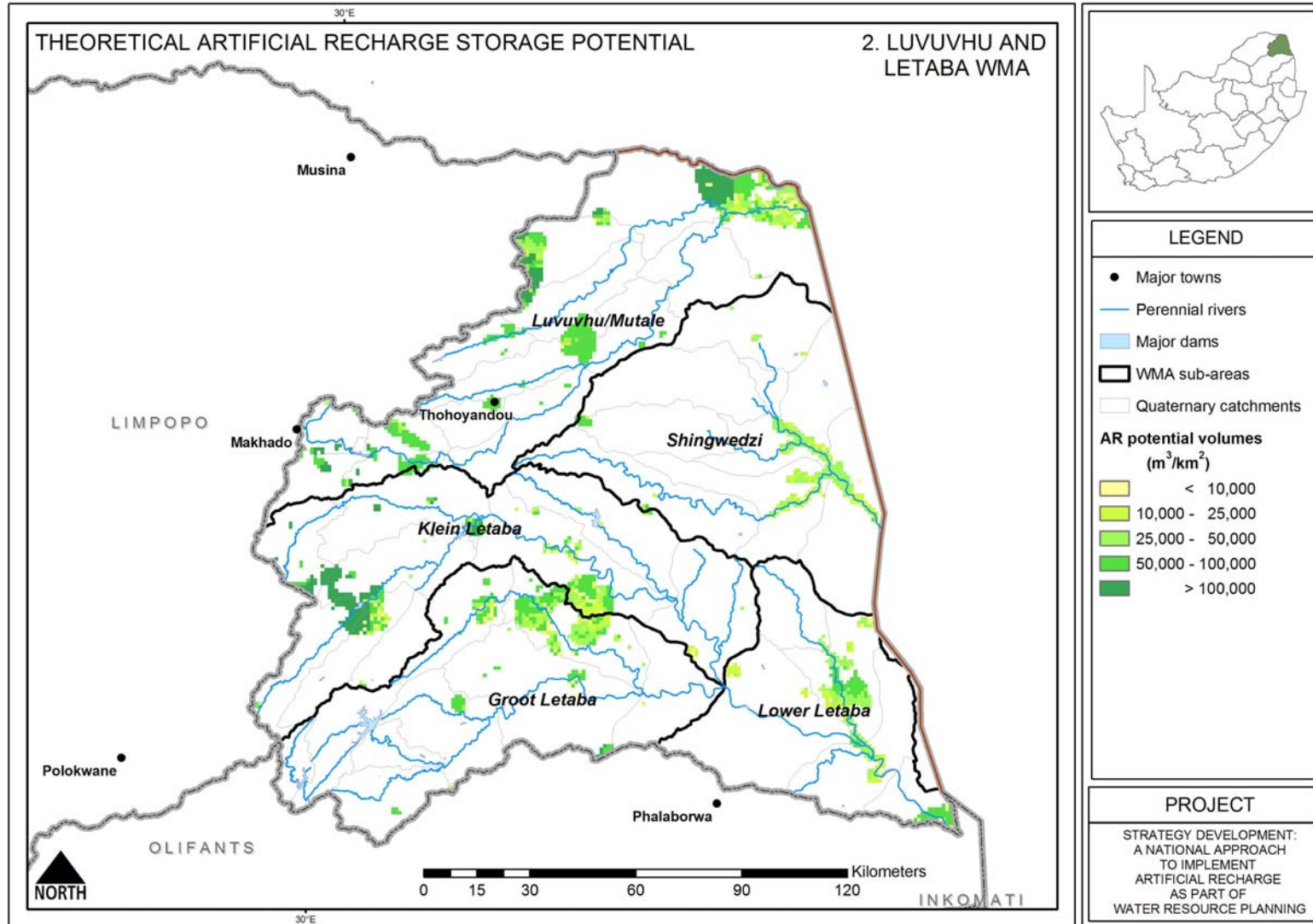
Water Management Area 2: Luvuvhu/Letaba

WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
2 Luvuvhu	Luvuvhu/Mutale	520	105		115	119	43	56	99
	Shingwedzi	90	14		3	3	10	8	18
	Groot Letaba	382	72		159	174	16	19	35
	Klein Letaba	151	20		32	37	21	32	52
	Lower Letaba	42	13		1	0	11	12	24
	Total for WMA2		1185	224	531	310	333	102	127

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*



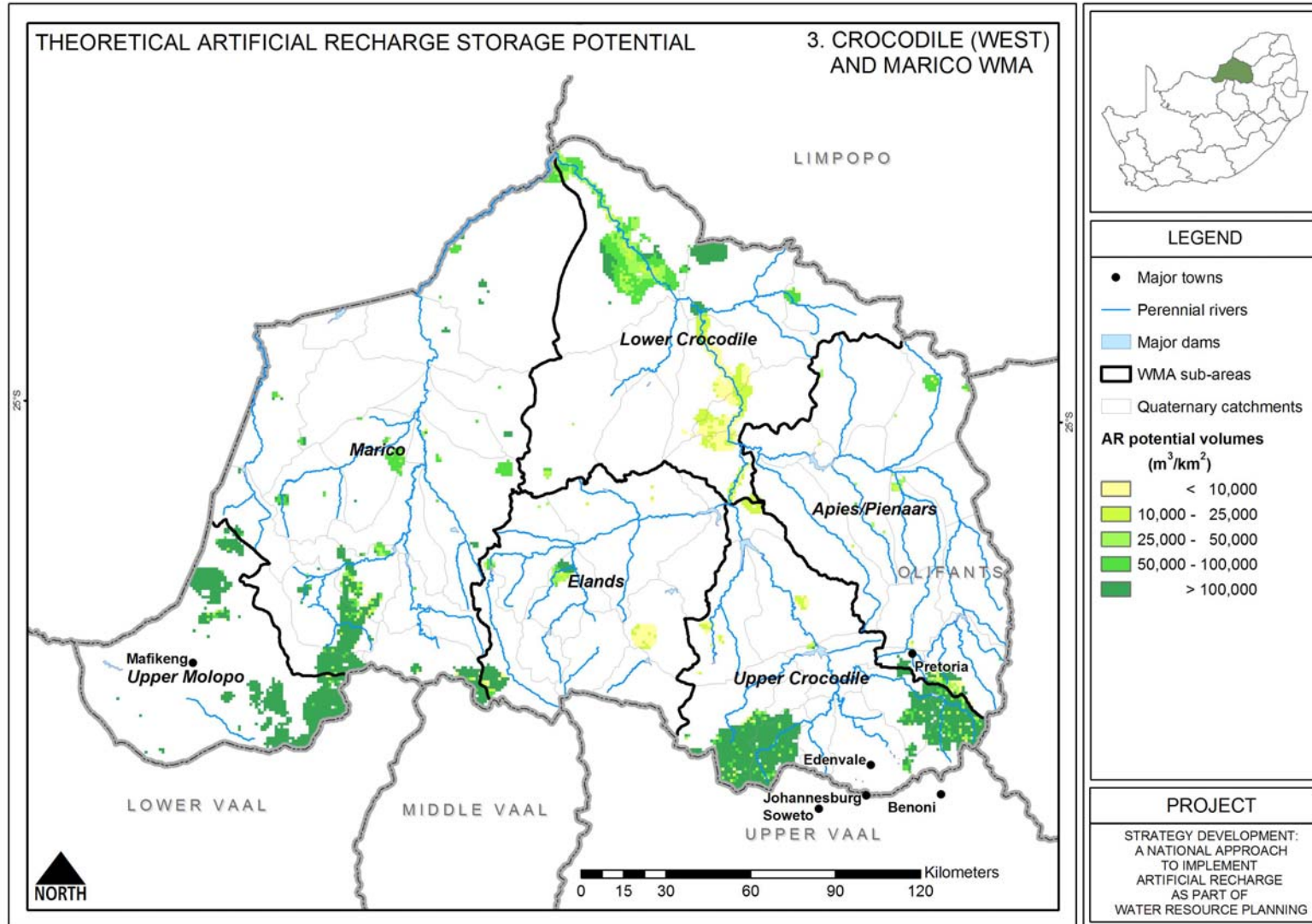
Water Management Area 3: Crocodile West and Marico

WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
3 Crocodile West Marico	Apies/Pienaars	142	34		186	280	10	22	32
	Upper Crocodile	253	57		336	556	358	613	971
	Elands	113	15		86	113	8	13	22
	Lower Crocodile	138	25		59	171	25	80	105
	Marico	172	29		32	40	141	284	425
	Upper Molopo	37	4		19	24	293	223	515
	Total for WMA 3	855	164	854	718	1184	835	1235	2070

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*



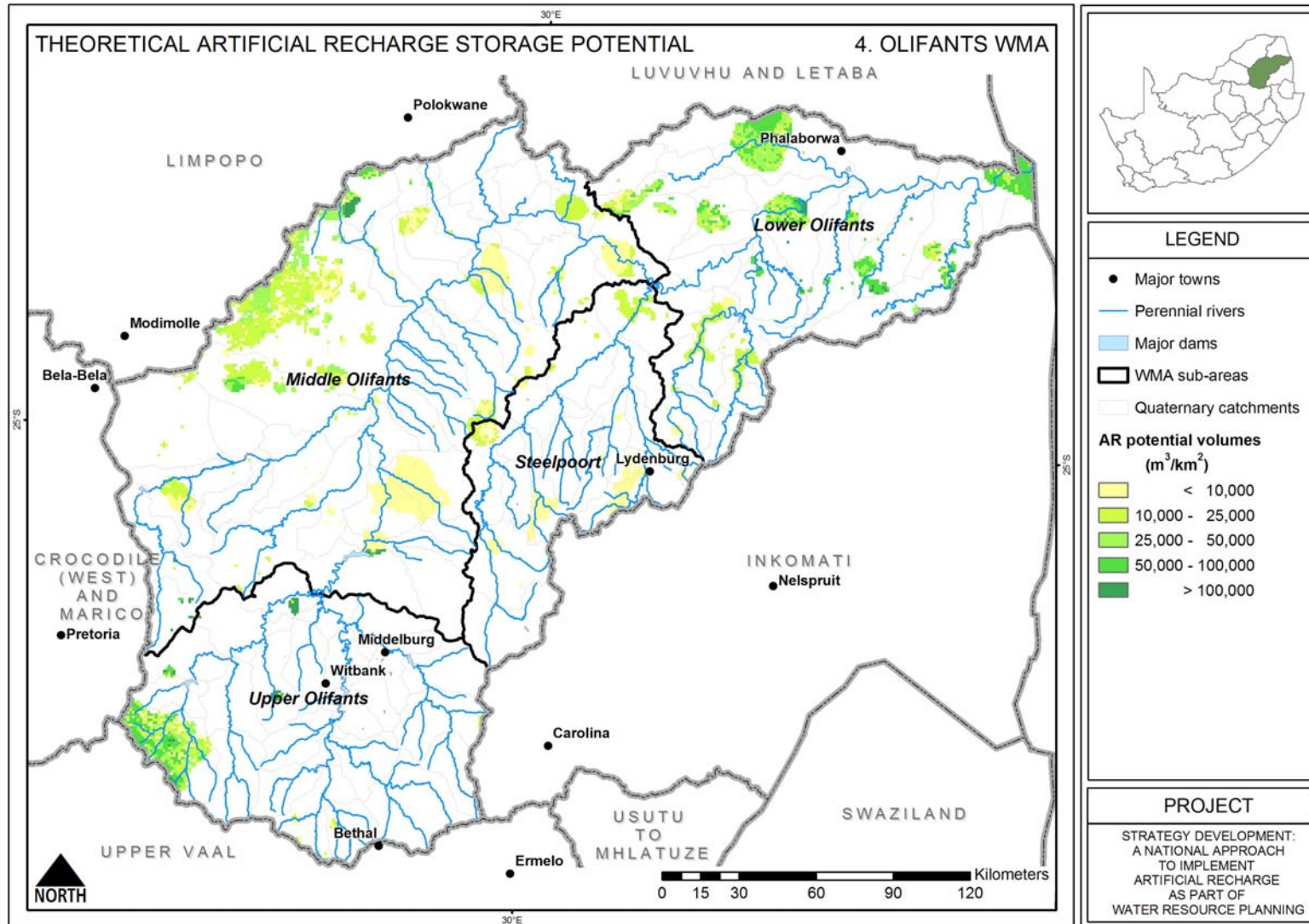
Water Management Area 4: Olifants

WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
4 Olifants	Upper Olifants	465	83		238	314	38	35	73
	Middle Olifants	481	69		210	392	38	54	91
	Steelpoort	396	94		61	95	3	5	8
	Lower Olifants	698	214		100	164	59	70	130
	Total for WMA4	2040	460	1078	609	965	138	163	301

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*



Water Management Area 5: Inkomati

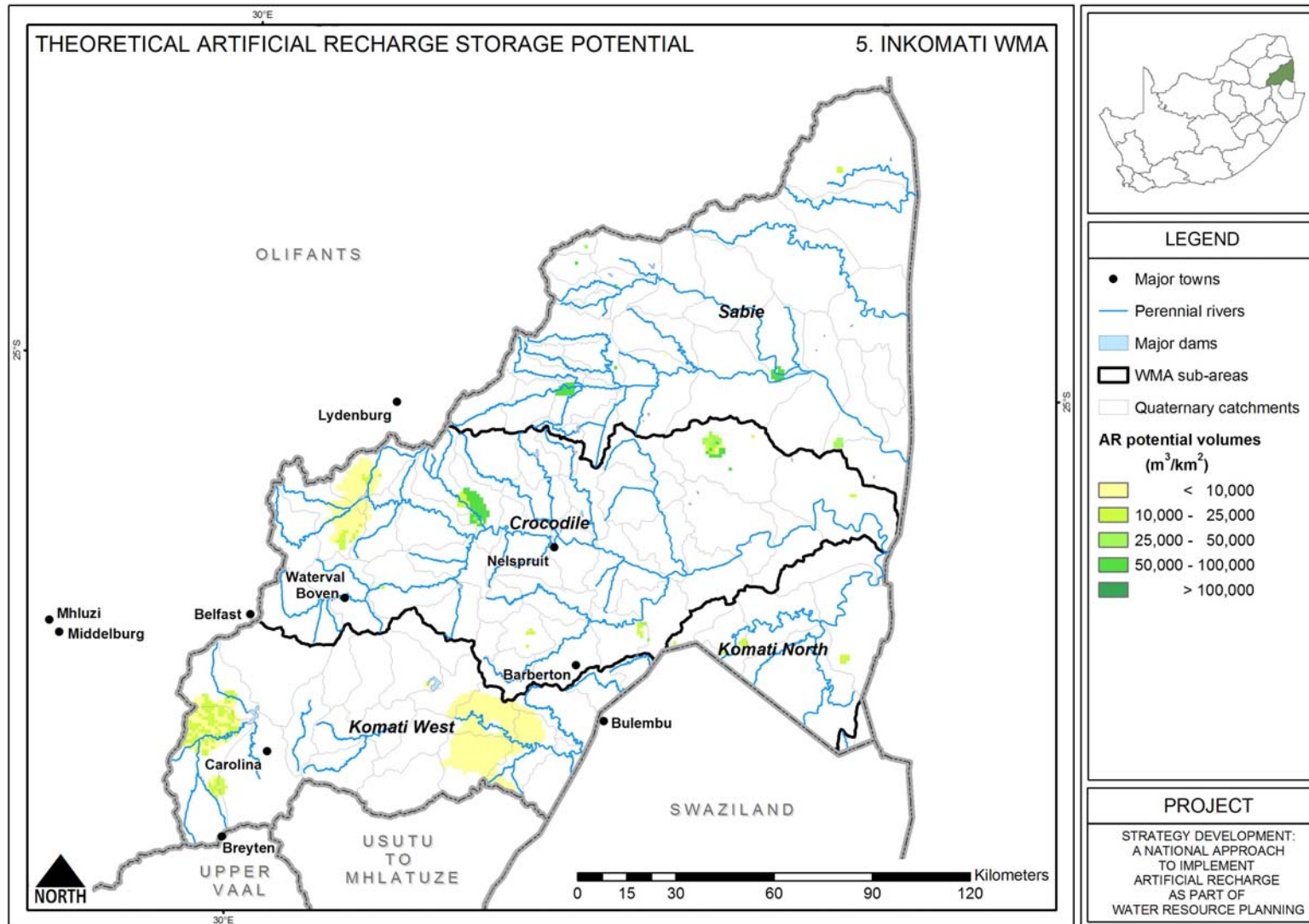
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
5 Inkomati	Komati (W Swazi)	749	239		118	65	7	7	14
	Swaziland	517	100		185	67	N/A	N/A	N/A
	Komati (N Swazi)	130	25		252	232	0	0	1
	Crocodile	1277	328		246	364	5	7	12
	Sabie	866	316		95	117	2	4	6
	Total for WMA5		3539	1008	768	896	845	15	17

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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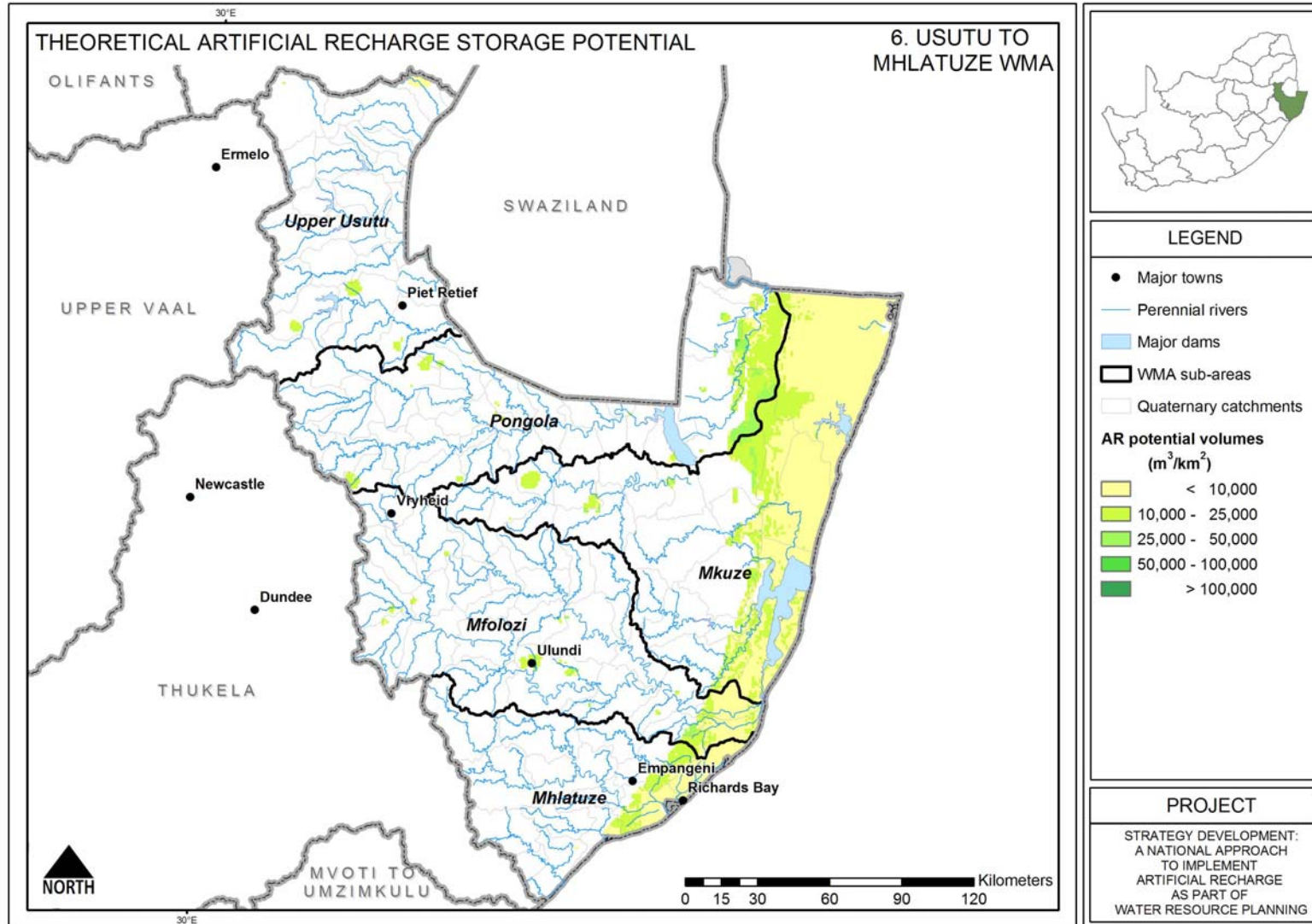
Water Management Area 6: Usutu to Mhlathuze

WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
6 Usutu-Mhlathuze	Upper Usutu	901	328		202	69	1	1	2
	Pongola	1344	200		645	255	7	17	24
	Mkuze	635	218		33	78	36	40	77
	Mfolozi	962	275		51	80	4	6	11
	Mhlathuze	938	171		179	235	6	8	14
	Total for WMA6		4780	1192	3692	1110	717	54	73

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*



Water Management Area 7: Thukela

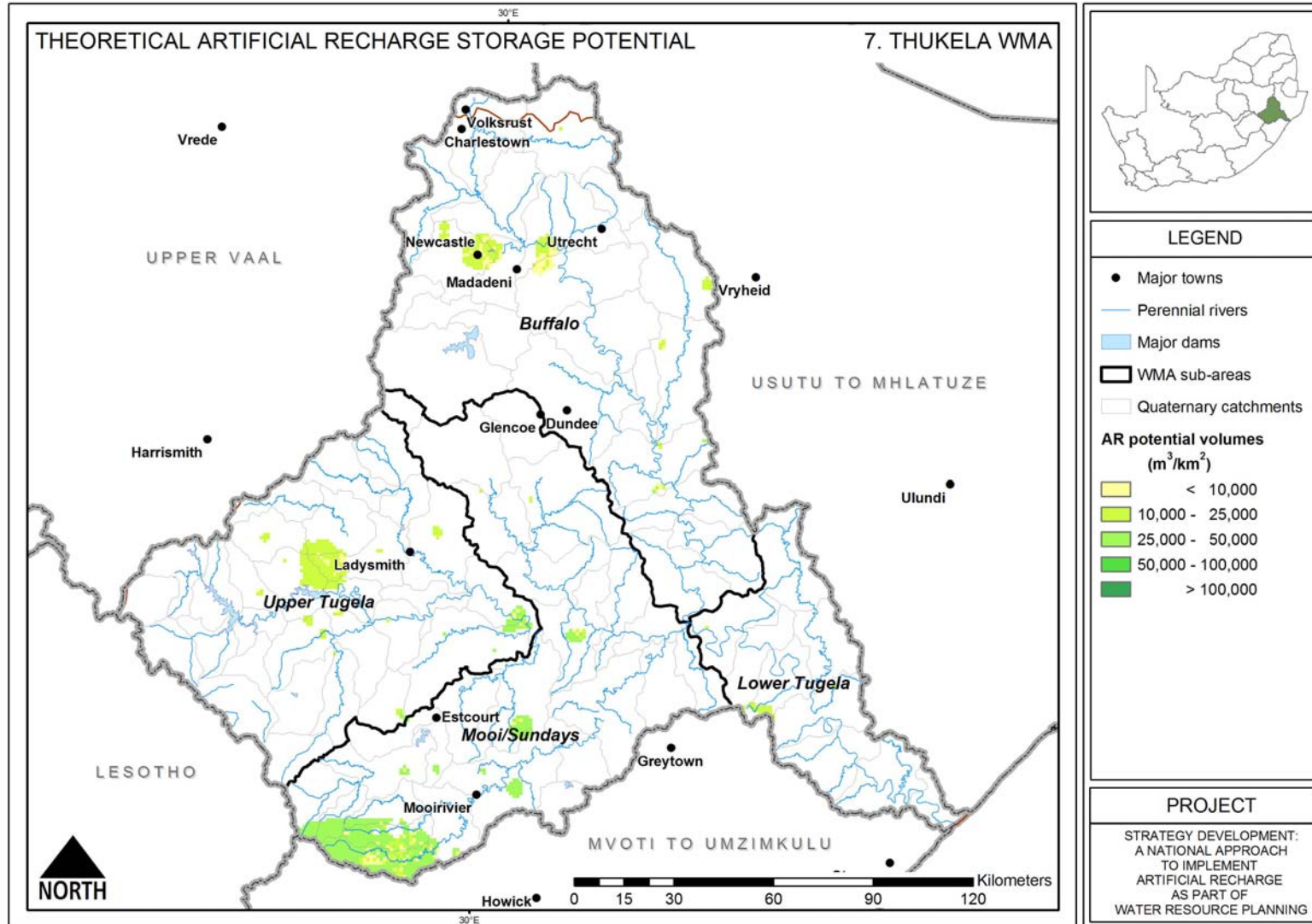
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
7 Thukela	Upper Thukela	1502	392		394	88	4	5	9
	Mooi/Sundays	992	213		128	102	9	18	27
	Buffalo	941	182		136	91	3	3	6
	Lower Thukela	364	72		79	53	0	0	1
	Total for WMA7	3799	859	1125	737	334	16	27	42

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 8: Upper Vaal
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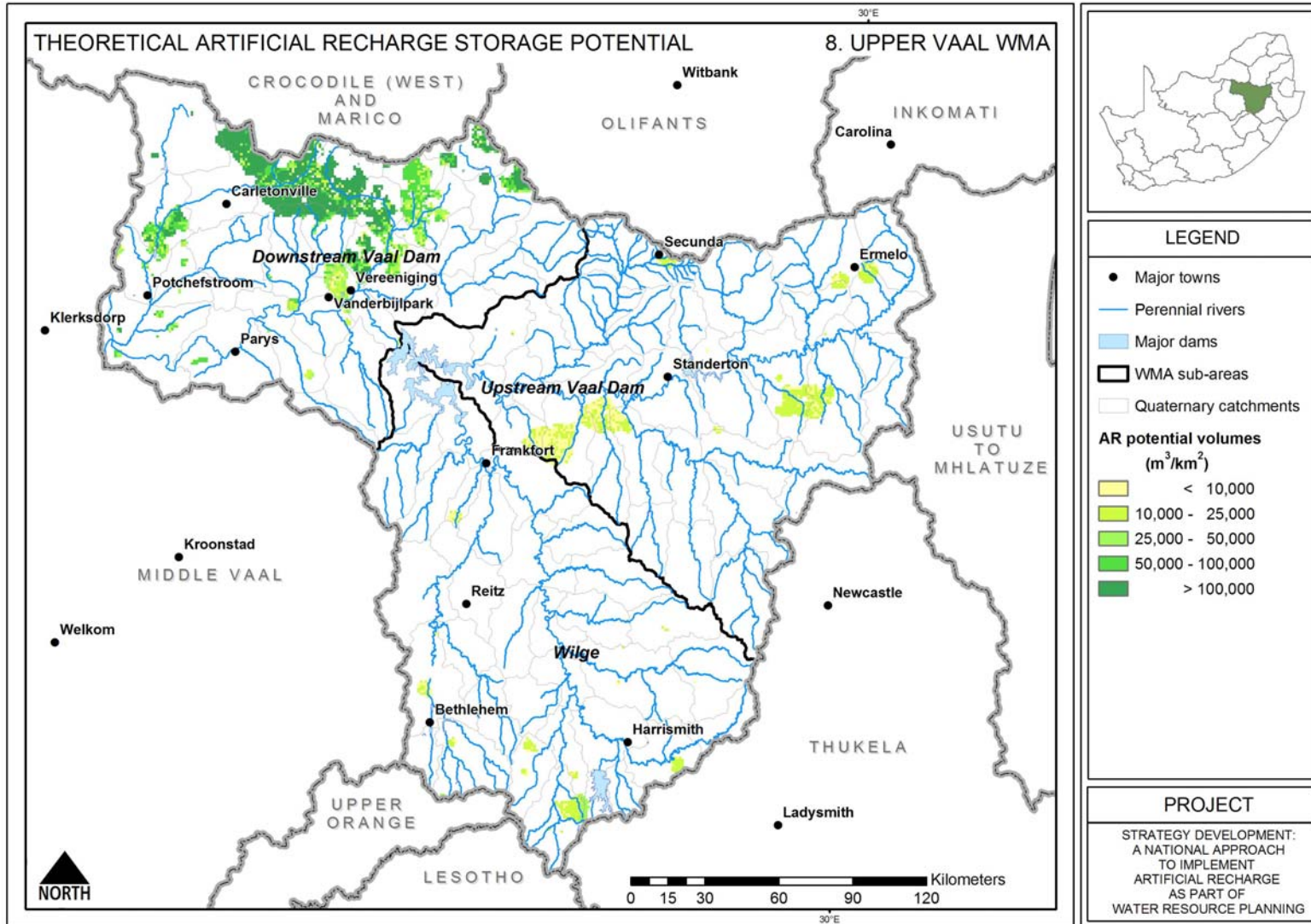
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
8 Upper Vaal	Wilge	868	116		59	60	4	5	9
	Vaal Dam - upstream	1109	126		184	216	14	9	23
	Vaal Dam - downstream	446	57		889	769	304	427	731
	Total for WMA8	2423	299	5725	1132	1045	322	441	763

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 9: Middle Vaal

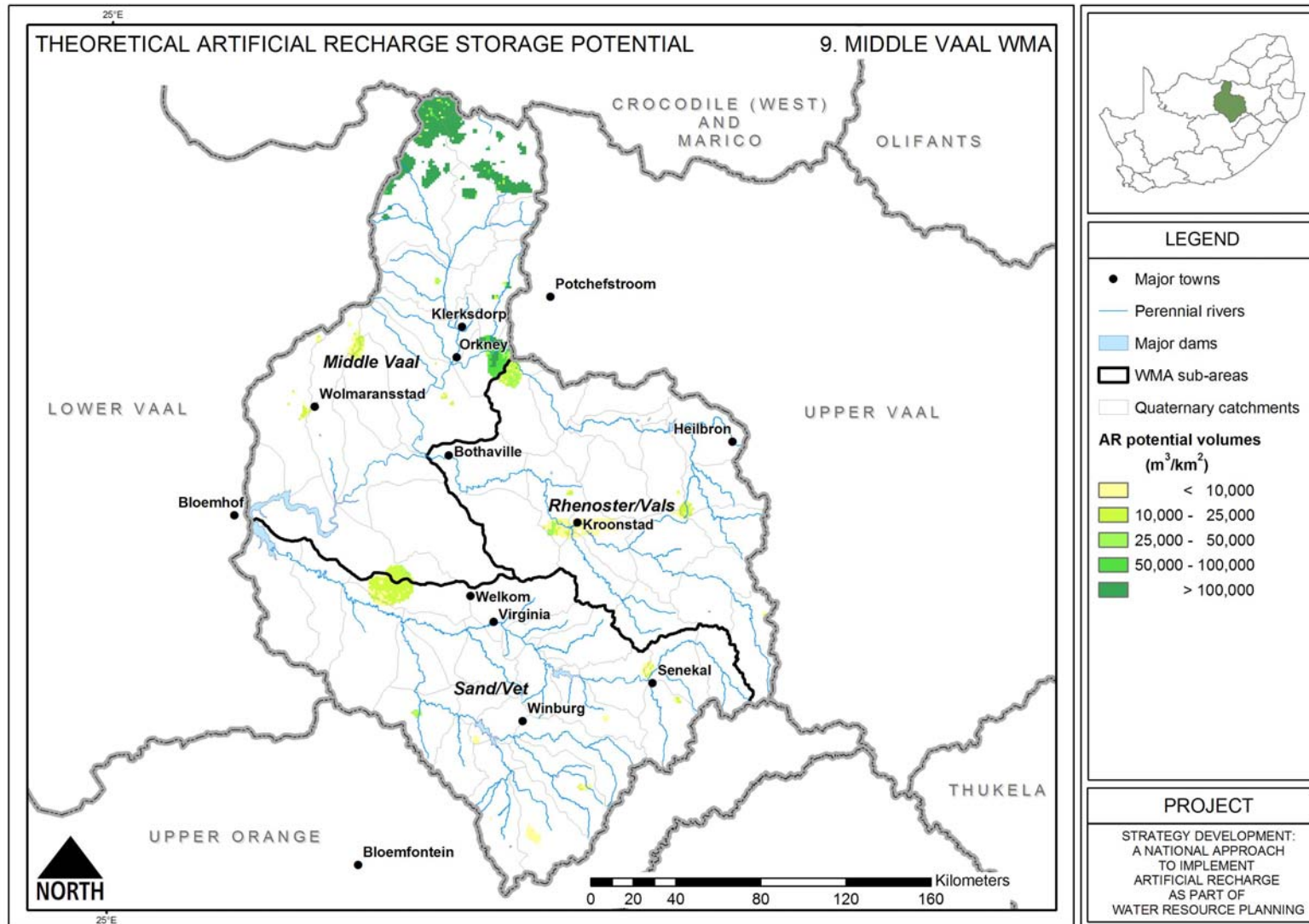
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
9 Middle Vaal	Rhenoster-Vals	295	35		44	54	8	5	13
	Middle Vaal	170	29		-142	129	443	472	915
	Sand-Vet	423	45		147	187	4	4	8
	Total for WMA9	888	109	467	49	370	455	481	935

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* Derived from GRAII data sets (refer to Section B.4)

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Water Management Area 10: Lower Vaal

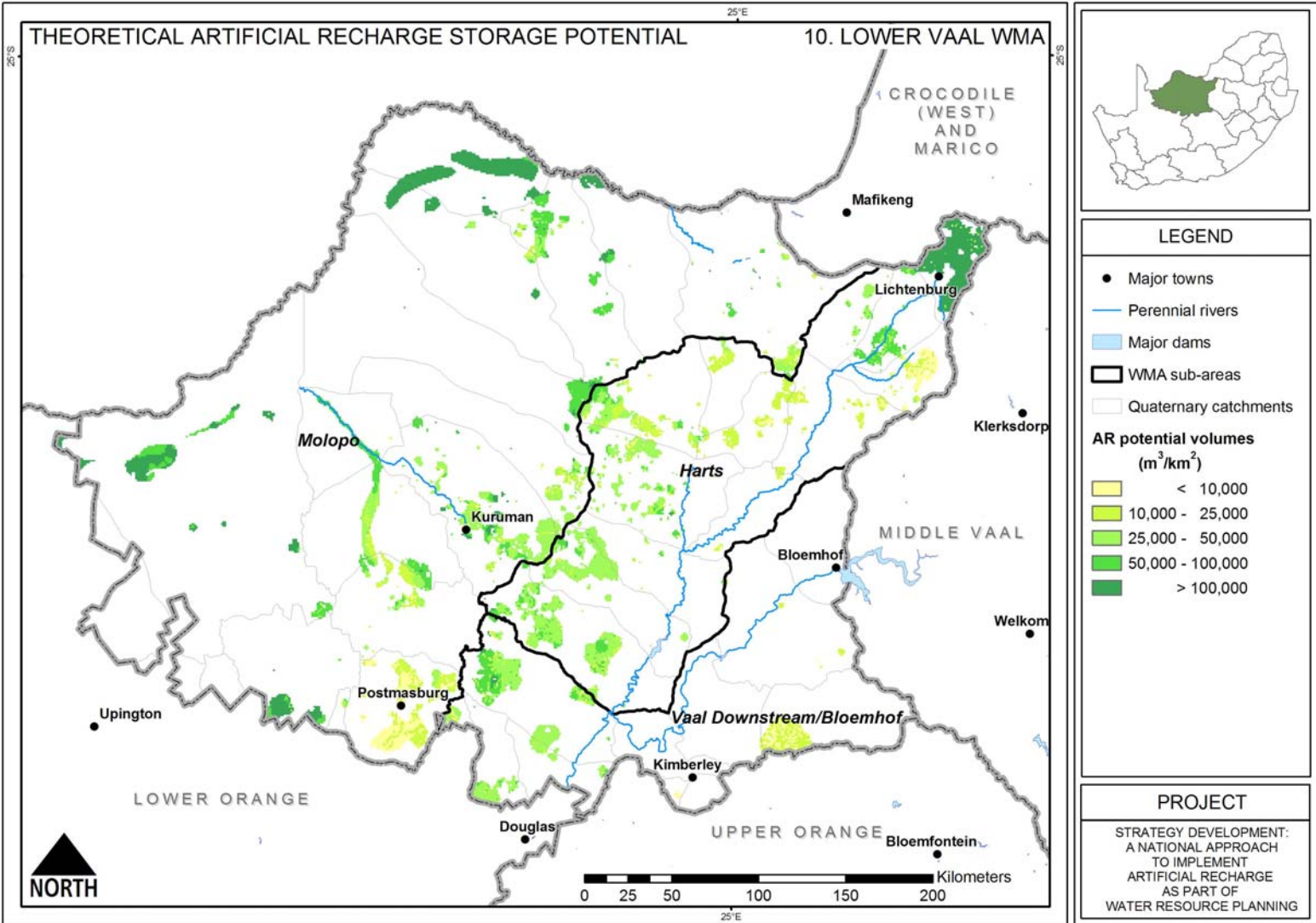
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
10 Lower Vaal	Harts	138	15		136	494	628	632	1260
	Vaal downstream of Bloemhof Dam	43	5		-46	113	65	63	128
	Molopo	197**	29		35	36	152	552	703
	Total for WMA10	181	49	1375	125	643	845	1247	2092

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* Derived from GRAII data sets (refer to Section B.4)

** Estimated runoff from catchment, which is lost through evaporation and infiltration before reaching the Orange River. This runoff therefore does not add to the total for the Water Management Area.



Water Management Area 11: Mvoti to Umzimkulu

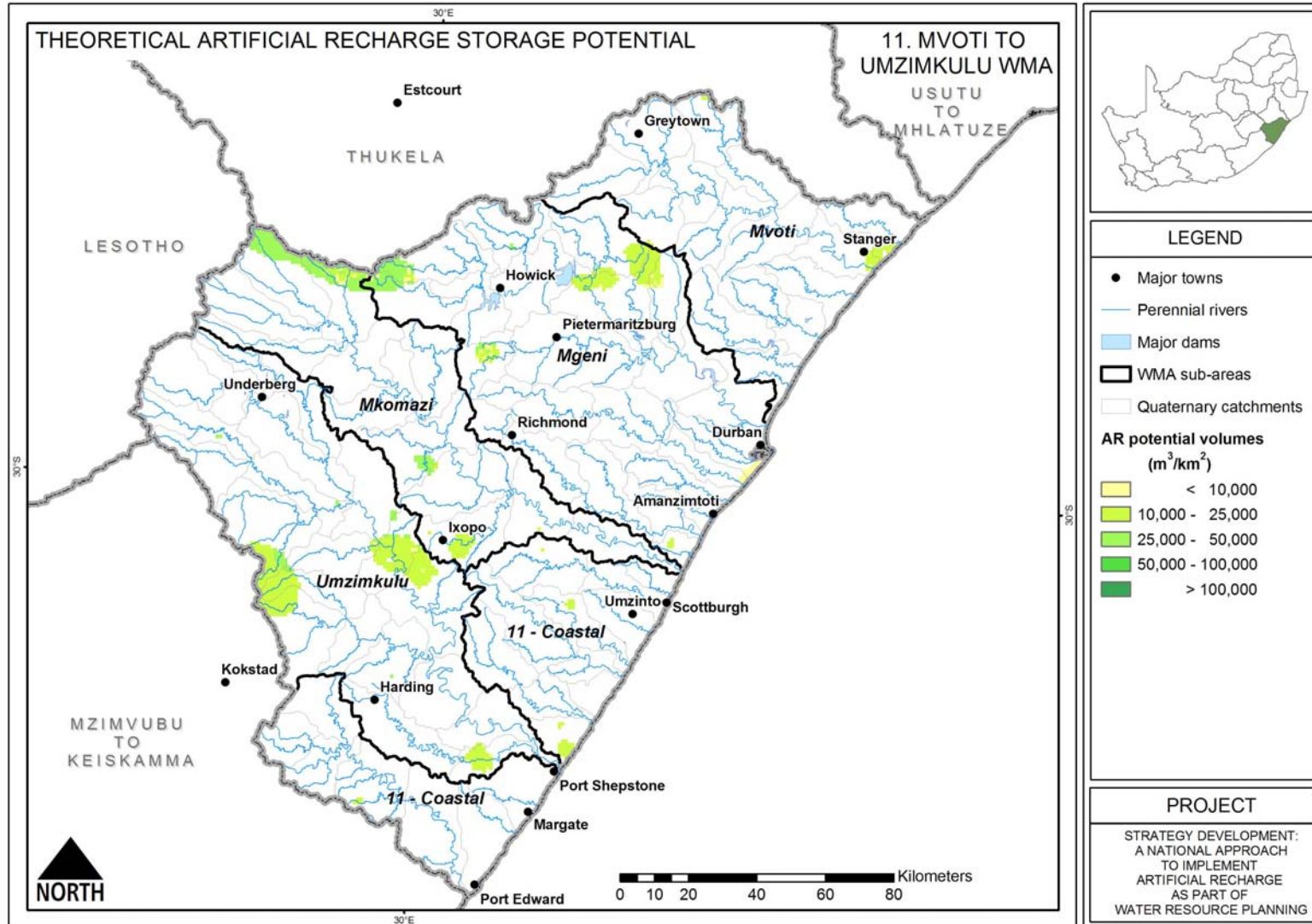
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
11 Mvoti-Umzimkulu	Mvoti	595	150		86	114	0	1	1
	Mgeni	992	187		376	504	3	7	11
	Mkomazi	1080	295		31	98	4	8	12
	Coastal	758	211		14	41	0	1	1
	Umzimkulu	1373	317		16	40	5	10	15
	Total for WMA11	4798	1160		827	523	797	13	27

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 12: Mzimvubu to Keiskamma

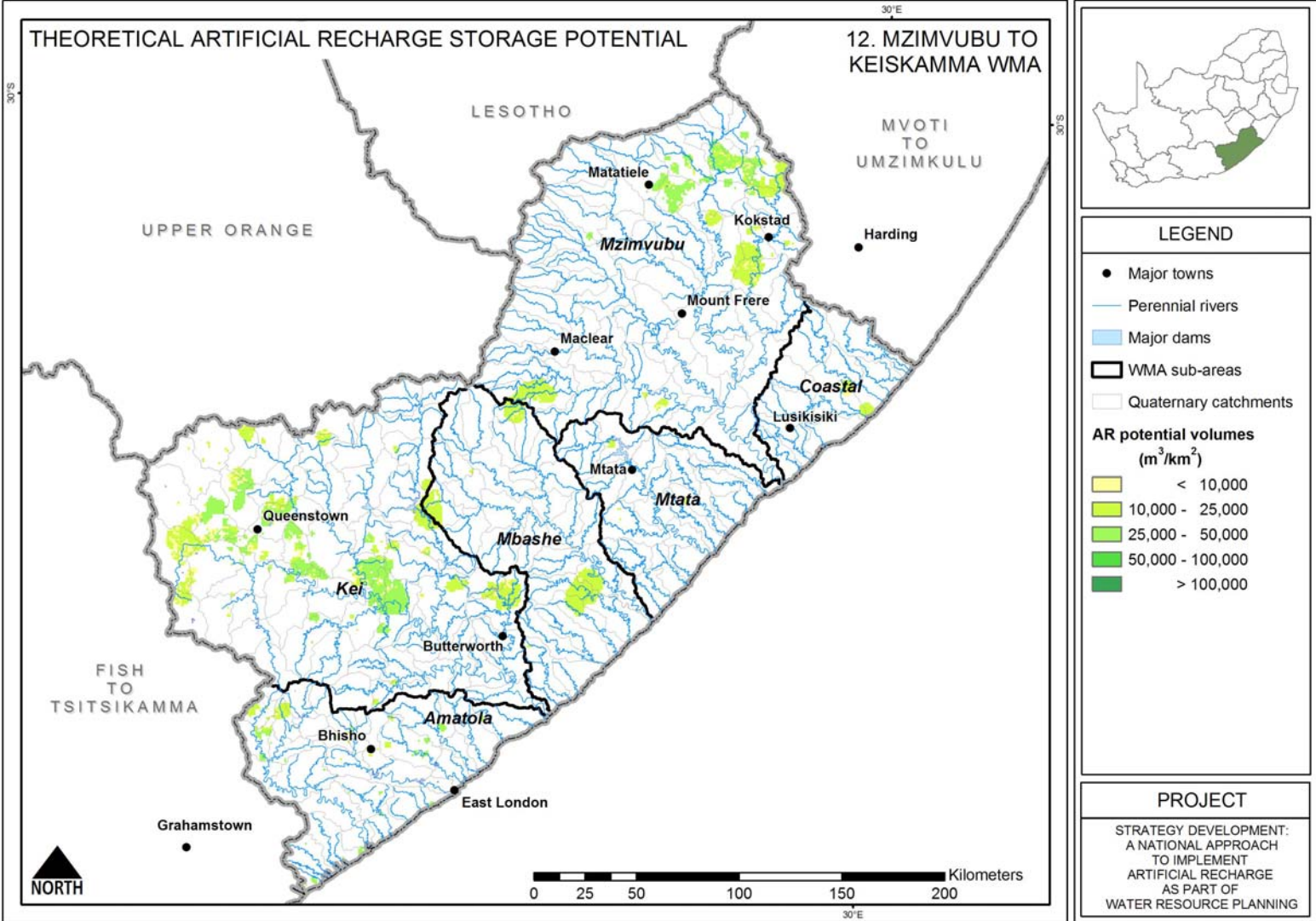
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
12 Mzimvubu-Keiskamma	Mzimvubu	2897	338		91	33	16	30	46
	Mtata	836	163		136	53	0	0	1
	Mbashe	1126	203		114	11	7	8	15
	Kei	1027	154		359	174	39	52	91
	Amatola	559	116		149	99	4	1	5
	Wild Coast	796	148		5	4	1	6	7
	Total for WMA12	7241	1122		1115	854	374	67	98

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 13: Upper Orange

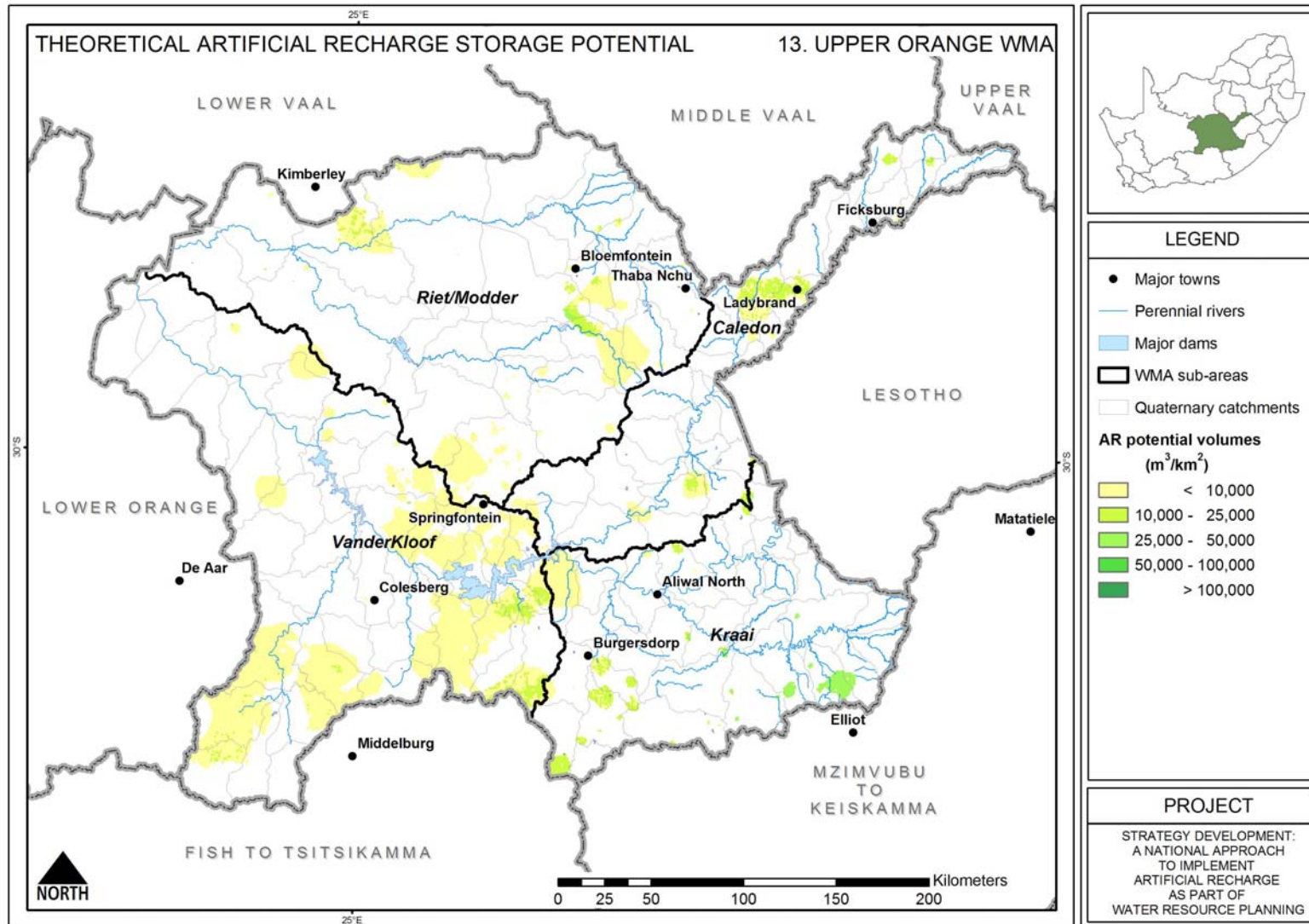
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
13 Upper Orange	Senqu Lesotho	4012	933		523	23	N/A	N/A	N/A
	Caledon Lesotho	753	92		31	40	N/A	N/A	N/A
	Caledon RSA	650	90		178	105	11	10	20
	Kraai	956	158		44	103	16	20	36
	Riet / Modder	407	45		137	351	16	16	31
	Vanderkloof	203	31		3534	346	77	54	132
	Total for WMA13	6981	1349		11711	4447	968	119	100

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 14: Lower Orange

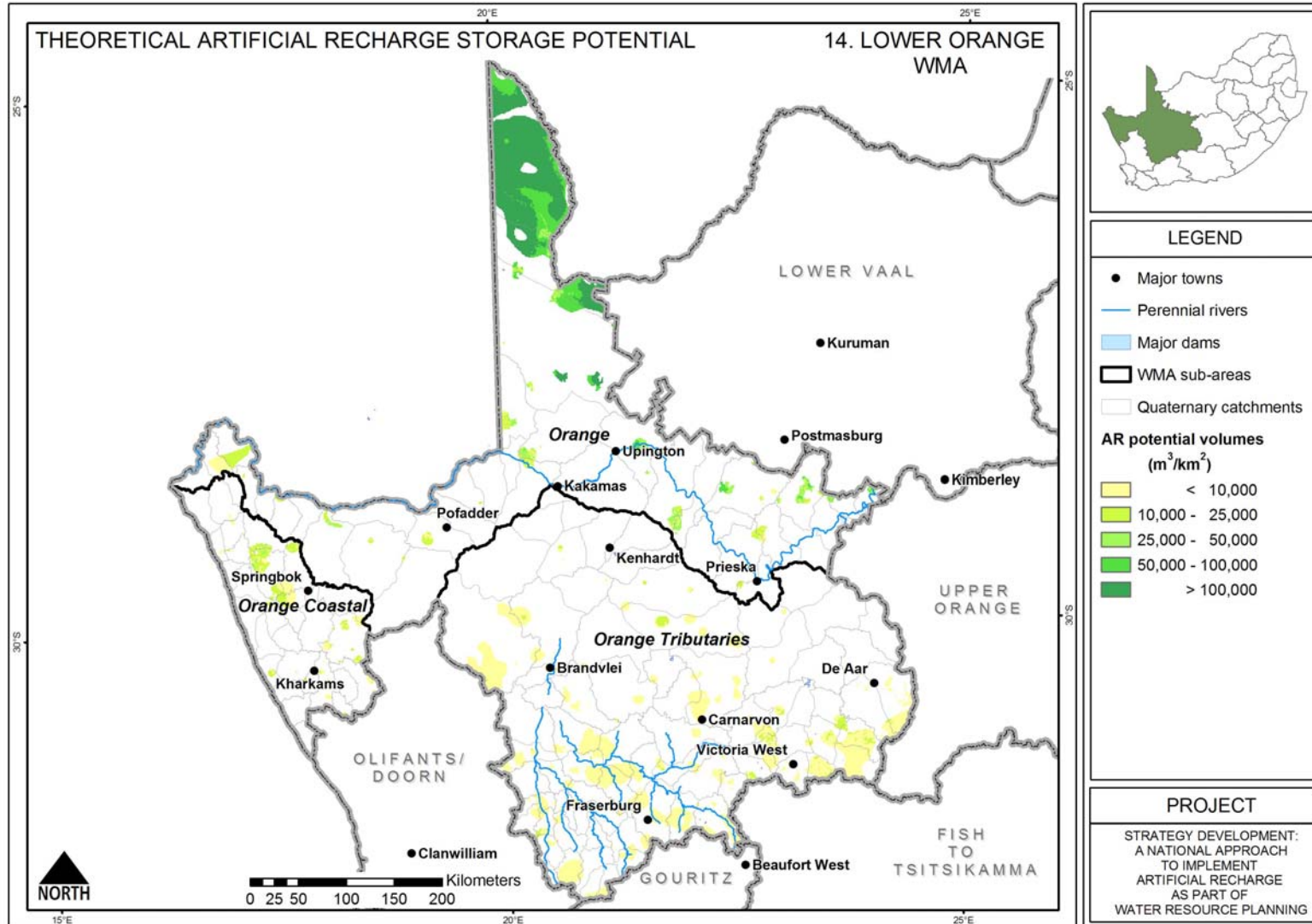
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
14 Lower Orange	Orange	198	32		-986	989	289	1514	1802
	Orange Tributaries	280	35		22	31	94	83	177
	Orange Coastal	24	2		3	8	14	24	38
	Total for WMA14	502	69	298	-961	1028	397	1620	2017

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* Derived from GRAII data sets (refer to Section B.4)

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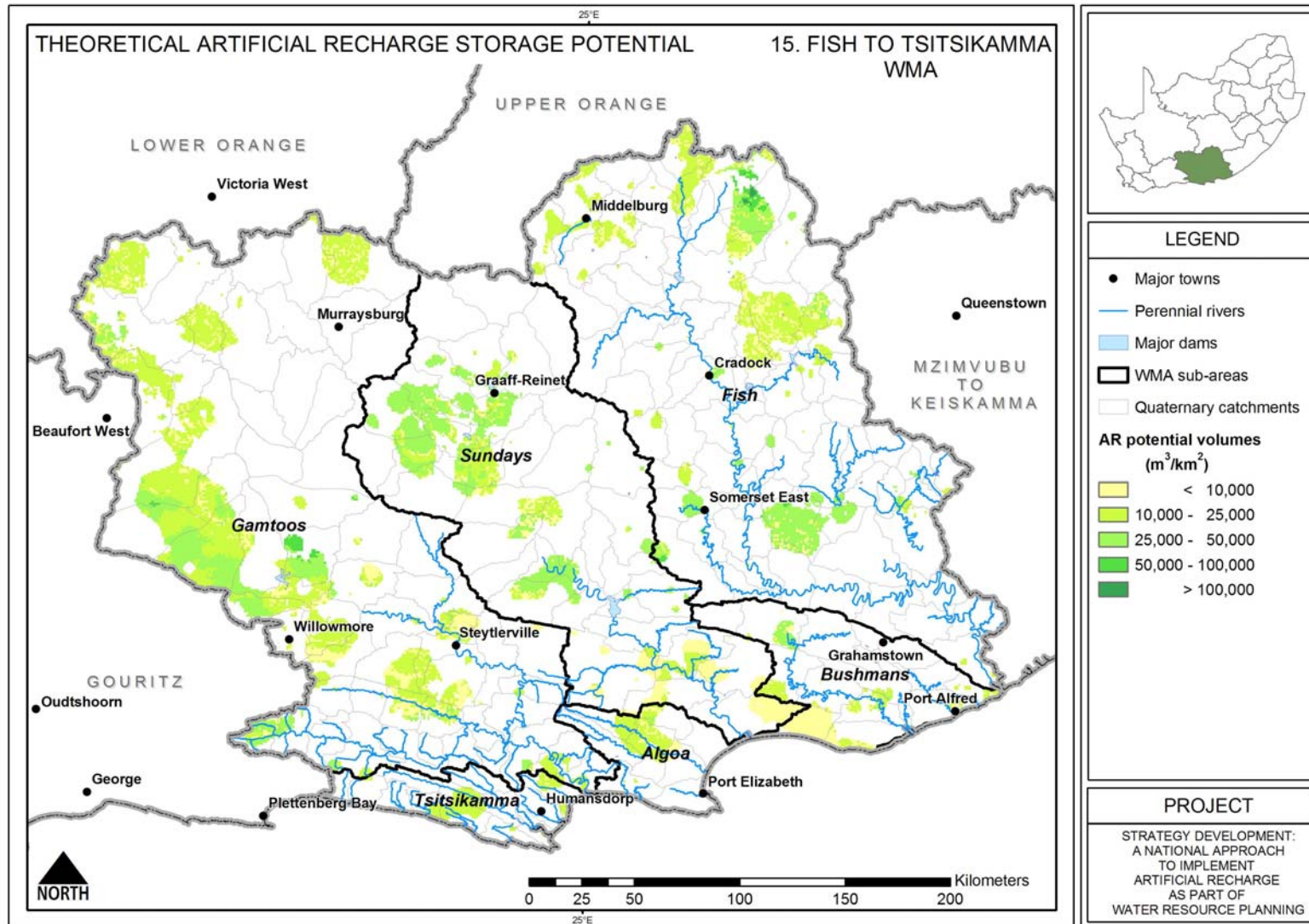
Water Management Area 15: Fish to Tsitsikamma

WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
15 Fish-Tsitsikamma	Fish	518	47		84	473	66	91	157
	Bushmans	174	15		21	22	3	9	12
	Sundays	280	20		101	182	54	77	131
	Gamtoos	491	39		145	111	119	145	264
	Algoa	147	15		23	91	3	7	11
	Tsitsikamma	544	107		49	22	4	7	11
	Total for WMA15	2154	243		739	423	901	249	337

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*



Water Management Area 16: Gouritz

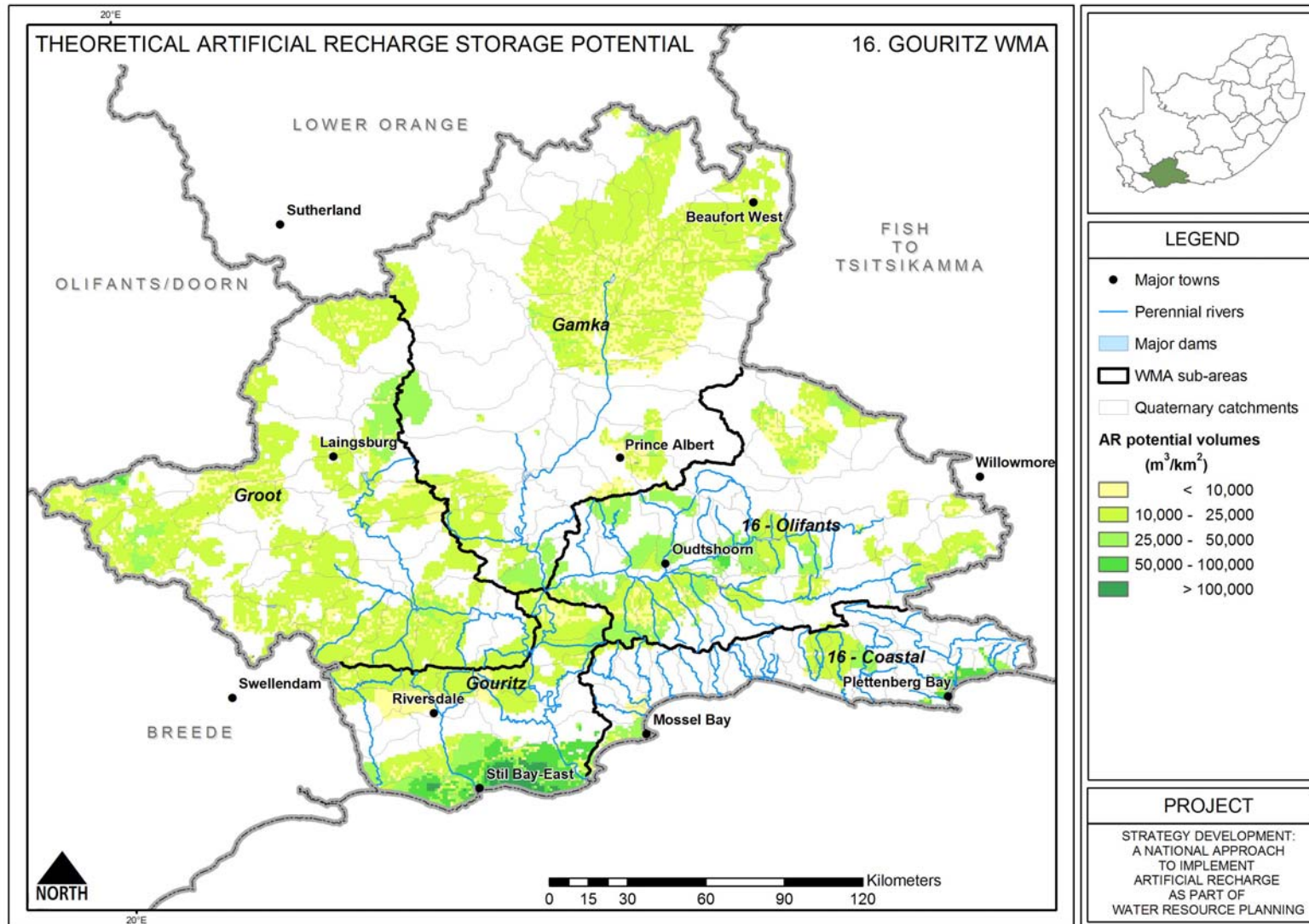
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
16 Gouritz	Gamka	227	19		48	55	113	110	223
	Groot	105	5		42	53	86	119	205
	Olifants	229	17		71	74	57	79	136
	Gouritz	347	56		59	58	49	122	171
	Coastal	771	228		55	98	7	21	28
	Total for WMA16	1679	325		301	275	338	313	451

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 17: Olifants/Doorn

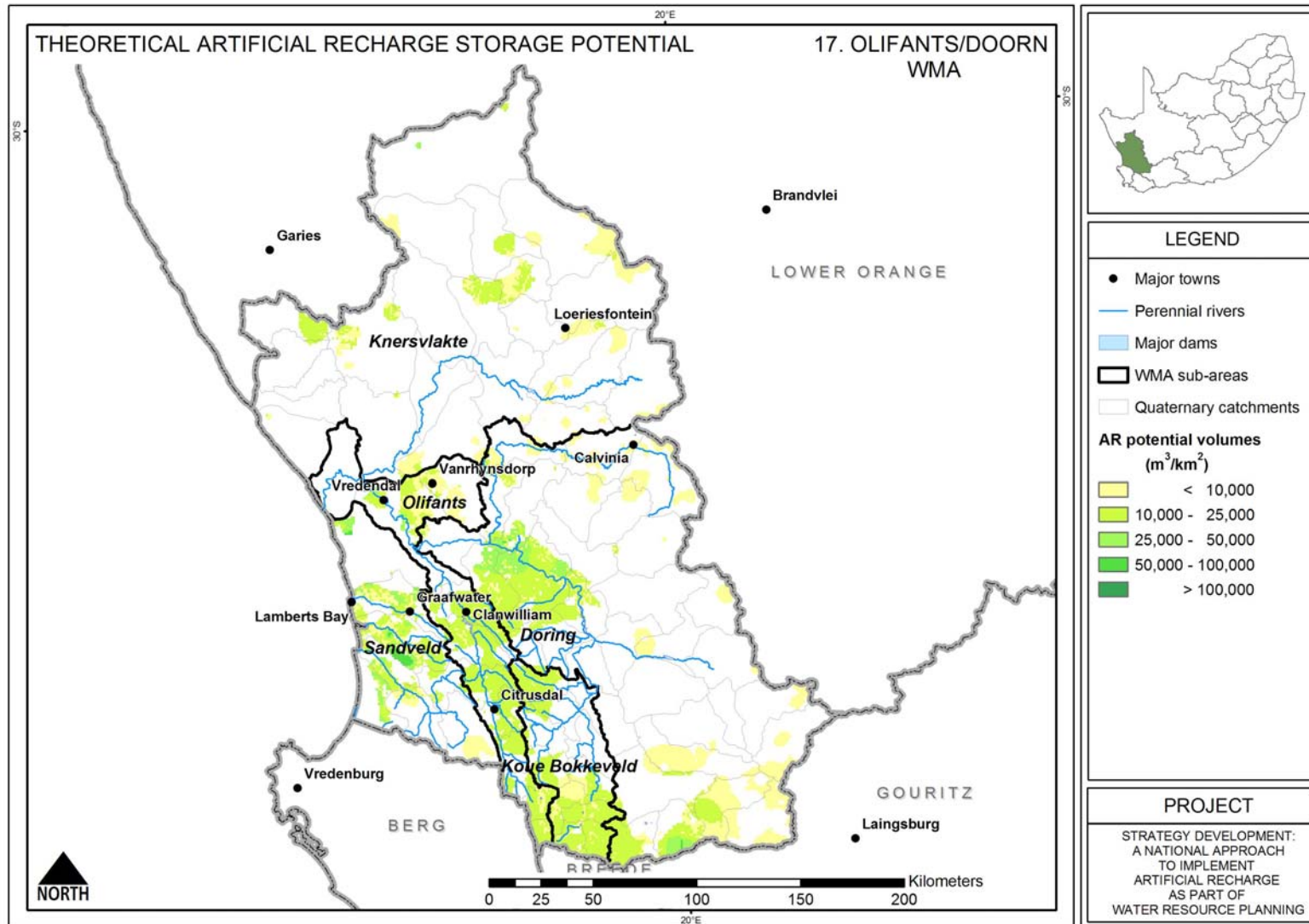
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
17 Olifants-Doorn	Koue Bokkeveld	279	29		67	66	18	22	40
	Sandveld	60	8		32	38	15	27	42
	Olifants	514	77		221	247	22	30	52
	Knersvlakte	27	3		4	7	10	15	26
	Doring	228	39		11	15	39	61	100
	Total for WMA17	1108	156	132	335	373	104	155	259

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

** Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 18: Breede

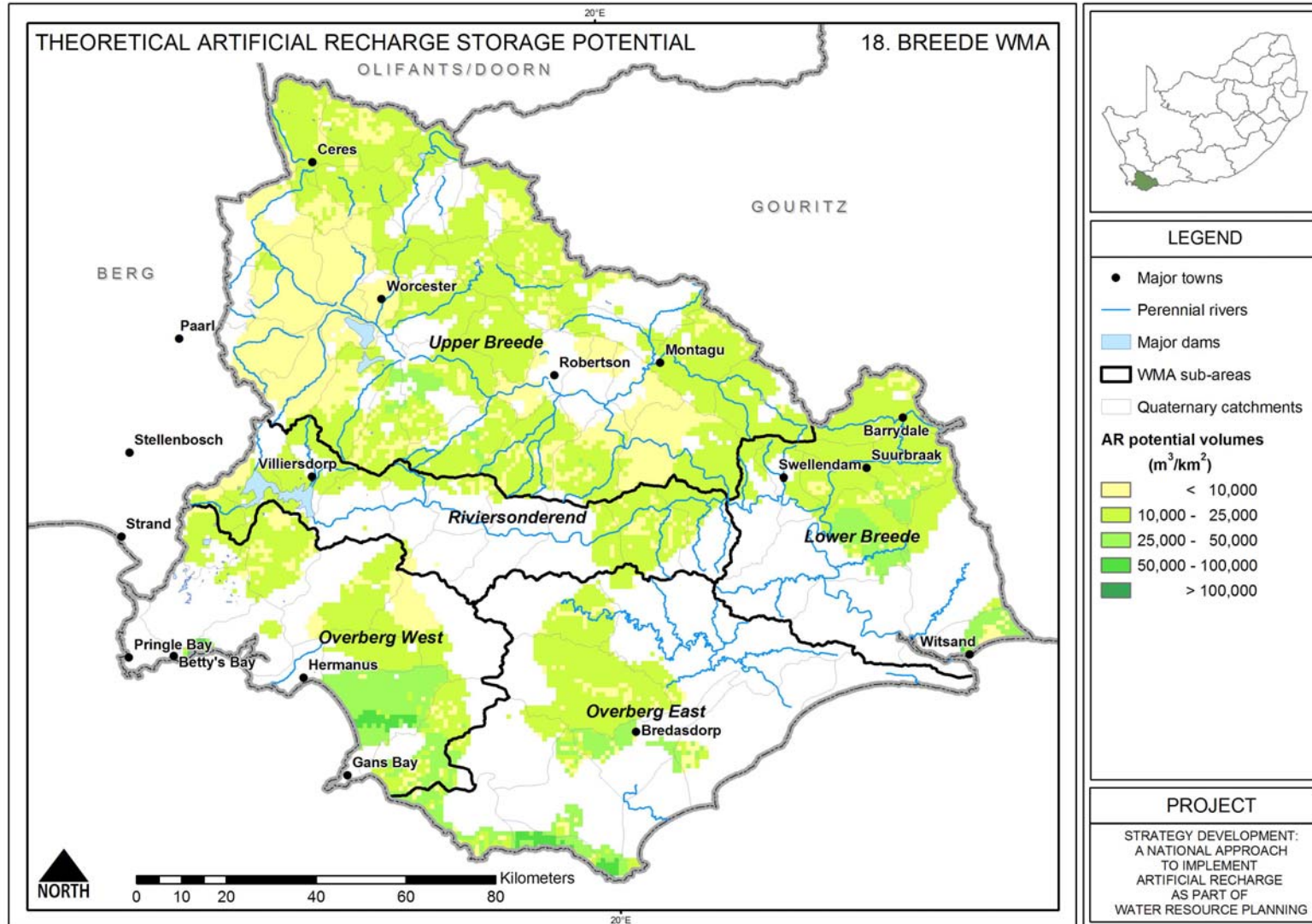
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
18 Breede	Upper Breede	1212	178		501	465	54	71	124
	Rivieronderend	460	65		226	53	8	11	19
	Lower Breede	210	34		36	31	12	26	37
	Overberg East	110	13		2	4	11	22	33
	Overberg West	480	94		99	79	17	28	44
	Total for WMA18		2472	384	1060	864	632	101	157

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* *Derived from GRAII data sets (refer to Section B.4)*

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Water Management Area 19: Berg

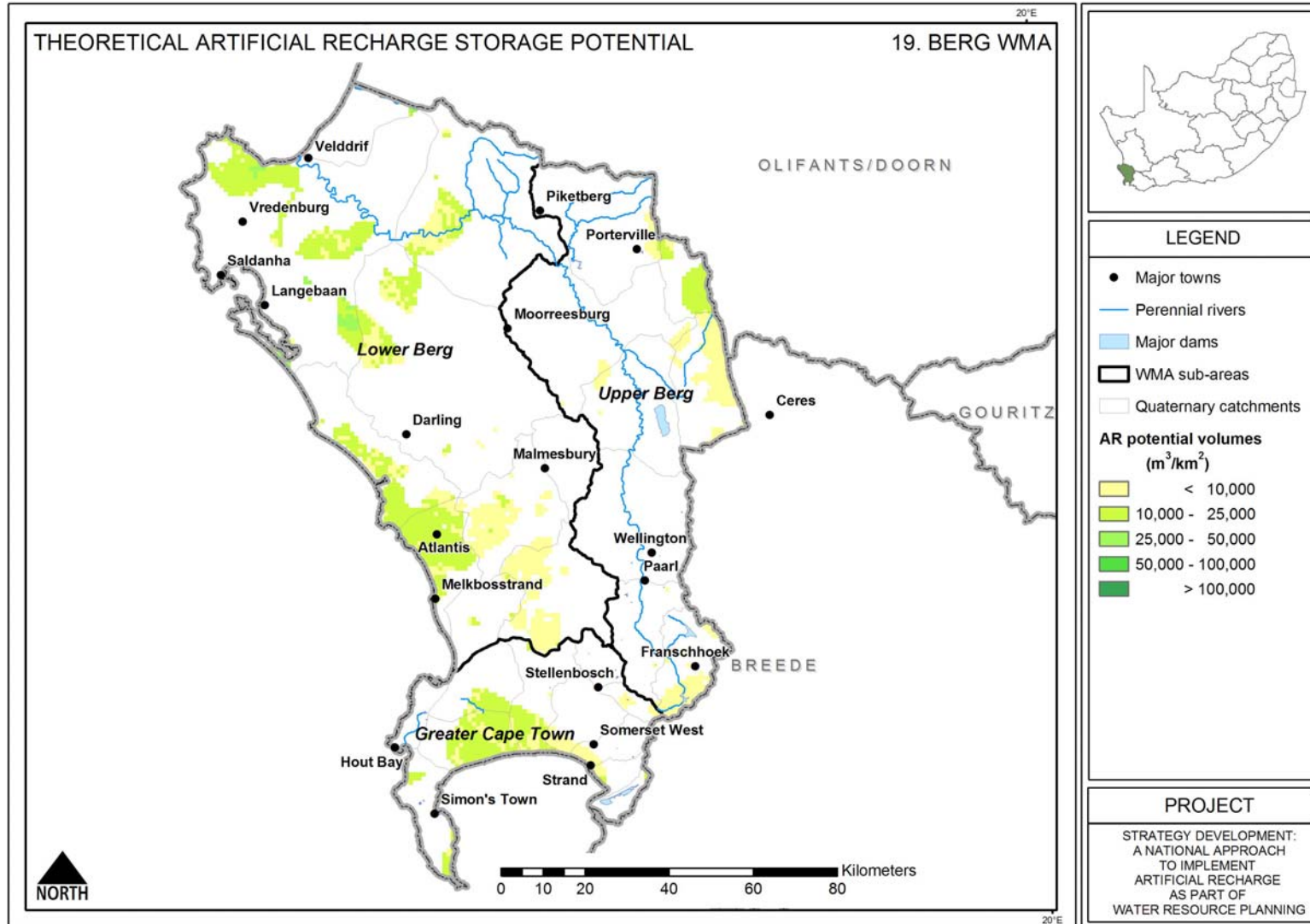
WMA data taken from NWRS, 2004							Groundwater storage in AR favourable areas*		
WMA	Component Sub-Area	Natural MAR (million m ³ /a)	Ecological Reserve (million m ³ /a)	Storage in major dams (million m ³)	Total local yield for year 2000 (million m ³ /a)	Total local water requirements for year 2000 (million m ³ /a)	Groundwater: 5m drawdown storage (million m ³)	Potential AR storage (million m ³)	Combined potential groundwater storage (AR + 5m drawdown) (million m ³)
19 Berg	Greater Cape Town	373	61		108	394	10	5	15
	Upper Berg	849	124		322	229	3	3	6
	Lower Berg	207	32		52	81	29	17	46
	Total for WMA19	1429	217	295	482	704	42	25	68

MAR: Mean Annual Runoff

The total local yield is the sum of useable surface water, existing groundwater use and useable return flows, as defined in the NWRS, 2004.

* Derived from GRAII data sets (refer to Section B.4)

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