

Michell's Pass Diversion URVs

MICHELLS PASS DIVERSION SCHEME - BULK WATER COSTS															
Scheme Size : 3m ³ /s															
(COSTS IN MILLION RAND, INCLUDING VAT)															
(SUPPLY IN MILLION CUBIC METERS PER YEAR)															
Yield		29.2 mcm/a													
Demand Growth		2% p/a													
Years to Full Supply		3.3 Years													
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS									
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR									
PIPELINE	122.05			122.05	1.00	MAINTENANCE: (0.25% Civil) = 0.877									
WEIR	34.54			34.54	1.00	(4% Mech & Elec) = 2.427 3.304 1.00									
BALANCING TANK	3.54			3.54	1.00	ELECTRICITY: Papenkuis									
DISCHARGE CHUTE	39.93			39.93	1.00	Power Required : 1750 KW									
STILLING BASIN	2.43			2.43	1.00	# Days Pumping : 100.0 days									
RIVER PROTECTION	136.52			136.52	1.00	Unit Rate : 75.00									
PAPENKUILS PUMPSTATION	6.74	42.47	18.20	67.42	1.00	Electricity Consumption Costs : 3.15									
SERVITUDE	4.99			4.99	1.00										
TOTAL CAPITAL COSTS	350.74	42.47	18.20	411.41											
WATER REQUIREMENTS					COSTS										
	CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	PIPELINE	WEIR	BAL TANK	DIS CHUTE	STILL BASIN	RIV PROTECT	P'KUILS RECOVER	SERVITUD E	MAINT	ENERGY	
	2012	1			0.00										
	2013	2			0.00										
	2014	3			61.03	17.27		19.96		68.26	33.71	4.99			
	2015	4			61.03	17.27		19.96		68.26	33.71				
	2016	5	9.73	7.707			3.54		2.43				3.30	3.15	
	2017	6	19.46	14.542									3.30	3.15	
	2018	7	29.20	20.585									3.30	3.15	
	2019	8	29.20	19.420									3.30	3.15	
	2020	9	29.20	18.320									3.30	3.15	
	2021	10	29.20	17.283									3.30	3.15	
	2022	11	29.20	16.305									3.30	3.15	
	2023	12	29.20	15.382									3.30	3.15	
	2024	13	29.20	14.512									3.30	3.15	
	2025	14	29.20	13.690									3.30	3.15	
	2026	15	29.20	12.915									3.30	3.15	
	2027	16	29.20	12.184									3.30	3.15	
	2028	17	29.20	11.494									3.30	3.15	
	2029	18	29.20	10.844									3.30	3.15	
	2030	19	29.20	10.230									3.30	3.15	
	2031	20	29.20	9.651									3.30	3.15	
	2032	21	29.20	9.105									3.30	3.15	
	2033	22	29.20	8.589									3.30	3.15	
	2034	23	29.20	8.103									3.30	3.15	
	2035	24	29.20	7.644									3.30	3.15	
	2036	25	29.20	7.212									3.30	3.15	
	2037	26	29.20	6.804									3.30	3.15	
	2038	27	29.20	6.418									3.30	3.15	
	2039	28	29.20	6.055									3.30	3.15	
	2040	29	29.20	5.712									3.30	3.15	
	2041	30	29.20	5.389									3.30	3.15	
DISCOUNT RATE @ 6.00%					296.10	105.55	29.87	2.97	34.53	2.04	118.06	58.30	4.44	36.07	34.39
UNIT REFERENCE VALUE = 1.44 (R/m ³)															
UNIT COST OF WATER															
FIXED COST:															
Interest and capital repayment @ 12% per annum :															
a) Civil Infrastructure - 20 year period (350.74) 46.957															
b) Mech./Elec equipment - 15 year period (60.67) 8.908 55.865															
OPERATING COST:															
a) Maintenance :															
i. Civil works (0,25%) 0.877															
ii. Mech./Elec. (4%) 2.427															
b) Energy costs 3.15 6.454															
TOTAL ANNUAL COST:					62.319	UNIT COST OF WATER = 2.13 (R/m³)									

MICHELLS PASS DIVERSION SCHEME - BULK WATER COSTS															
Scheme Size : 5m ³ /s															
(COSTS IN MILLION RAND, INCLUDING VAT)															
(SUPPLY IN MILLION CUBIC METERS PER YEAR)															
Yield		38.6 mcm/a													
Demand Growth		2% p/a													
Years to Full Supply		3.6 Years													
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS									
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR									
PIPELINE	157.68			157.68	1.00	MAINTENANCE: (0.25% Civil) = 1.016									
WEIR	39.34			39.34	1.00	(4% Mech & Elec) = 3.034 4.049 1.00									
BALANCING TANK	4.97			4.97	1.00										
DISCHARGE CHUTE	47.44			47.44	1.00										
STILLING BASIN	3.52			3.52	1.00	ELECTRICITY: Papenkuis									
RIVER PROTECTION	139.89			139.89	1.00	Power Required : 2750 KW									
PAPENKUIS PUMPSTATION	8.43	53.09	22.75	84.27	1.00	# Days Pumping : 100.0 days									
SERVITUDE	4.99			4.99	1.00	Unit Rate : 75.00									
						Electricity Consumption Costs : 4.95									
TOTAL CAPITAL COSTS	406.27	53.09	22.75	482.11											
WATER REQUIREMENTS					COSTS										
CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	PIPELINE	WEIR	BAL TANK	DIS CHUTE	STILL BASIN	RIV PROTECT	PKUILS RECOVER	SERVITUD E	MAINT	ENERGY		
2012	1														
2013	2														
2014	3			78.84	19.67		23.72		69.94	42.13	4.99				
2015	4			78.84	19.67	4.97	23.72	3.52	69.94	42.13					
2016	5	12.86										4.05	4.95		
2017	6	25.73										4.05	4.95		
2018	7	38.60										4.05	4.95		
2019	8	38.60										4.05	4.95		
2020	9	38.60										4.05	4.95		
2021	10	38.60										4.05	4.95		
2022	11	38.60										4.05	4.95		
2023	12	38.60										4.05	4.95		
2024	13	38.60										4.05	4.95		
2025	14	38.60										4.05	4.95		
2026	15	38.60										4.05	4.95		
2027	16	38.60										4.05	4.95		
2028	17	38.60										4.05	4.95		
2029	18	38.60										4.05	4.95		
2030	19	38.60										4.05	4.95		
2031	20	38.60										4.05	4.95		
2032	21	38.60										4.05	4.95		
2033	22	38.60										4.05	4.95		
2034	23	38.60										4.05	4.95		
2035	24	38.60										4.05	4.95		
2036	25	38.60										4.05	4.95		
2037	26	38.60										4.05	4.95		
2038	27	38.60										4.05	4.95		
2039	28	38.60										4.05	4.95		
2040	29	38.60										4.05	4.95		
2041	30	38.60										4.05	4.95		
DISCOUNT RATE € 6.00%				391.42	136.37	34.02	4.17	41.03	2.96	120.97	72.88	4.44	44.21	54.04	
														UNIT REFERENCE VALUE = 1.32 (R/m ³)	
UNIT COST OF WATER															
FIXED COST:															
Interest and capital repayment @ 12% per annum :															
a) Civil Infrastructure - 20 year period															
(406.27) 54.391															
b) Mech./Elec equipment - 15 year period															
(75.84) 11.135 65.526															
OPERATING COST:															
a) Maintenance :															
i. Civil works (0,25%) 1.016															
ii. Mech./Elec. (4%) 3.034															
b) Energy costs 4.95 8.999															
TOTAL ANNUAL COST: 74.526															
														UNIT COST OF WATER = 1.93 (R/m ³)	

MICHELLS PASS DIVERSION SCHEME - BULK WATER COSTS															
Scheme Size : 8m ³ /s															
(COSTS IN MILLION RAND, INCLUDING VAT)															
(SUPPLY IN MILLION CUBIC METERS PER YEAR)															
Yield		48.1 mcm/a													
Demand Growth		2% p/a													
Years to Full Supply		3.8 Years													
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS									
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR									
PIPELINE	188.14			188.14	1.00	MAINTENANCE: (0.25% Civil) = 1.167									
WEIR	45.00			45.00	1.00	(4% Mech & Elec) = 4.004 5.172 1.00									
BALANCING TANK	6.83			6.83	1.00	Papenkuils									
DISCHARGE CHUTE	57.02			57.02	1.00	ELECTRICITY: Power Required : 3800 KW									
STILLING BASIN	5.49			5.49	1.00	# Days Pumping : 100.0 days									
RIVER PROTECTION	148.31			148.31	1.00	Unit Rate : 75.00									
PAPENKUILS PUMPSTATION	11.12	70.08	30.03	111.23	1.00	Electricity Consumption Costs : 6.8									
SERVITUDE	4.99			4.99	1.00										
TOTAL CAPITAL COSTS	466.90	70.08	30.03	567.01											
WATER REQUIREMENTS					COSTS										
	CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	PIPELINE	WEIR	BAL TANK	DIS CHUTE	STILL BASIN	RIV PROTECT	PKUILS RECOVER	SERVITUD E	MAINT	ENERGY	
	2012	1													
	2013	2													
	2014	3			94.07	22.50		28.51		74.16	55.62	4.99			
	2015	4			94.07	22.50	6.83	28.51	5.49	74.16	55.62				
	2016	5	12.03	9.525									5.17	6.84	
	2017	6	24.05	17.972									5.17	6.84	
	2018	7	36.08	25.435									5.17	6.84	
	2019	8	48.10	31.989									5.17	6.84	
	2020	9	48.10	30.179									5.17	6.84	
	2021	10	48.10	28.470									5.17	6.84	
	2022	11	48.10	26.859									5.17	6.84	
	2023	12	48.10	25.338									5.17	6.84	
	2024	13	48.10	23.904									5.17	6.84	
	2025	14	48.10	22.551									5.17	6.84	
	2026	15	48.10	21.275									5.17	6.84	
	2027	16	48.10	20.070									5.17	6.84	
	2028	17	48.10	18.934									5.17	6.84	
	2029	18	48.10	17.863									5.17	6.84	
	2030	19	48.10	16.852									5.17	6.84	
	2031	20	48.10	15.898									5.17	6.84	
	2032	21	48.10	14.998									5.17	6.84	
	2033	22	48.10	14.149									5.17	6.84	
	2034	23	48.10	13.348									5.17	6.84	
	2035	24	48.10	12.592									5.17	6.84	
	2036	25	48.10	11.880									5.17	6.84	
	2037	26	48.10	11.207									5.17	6.84	
	2038	27	48.10	10.573									5.17	6.84	
	2039	28	48.10	9.974									5.17	6.84	
	2040	29	48.10	9.410									5.17	6.84	
	2041	30	48.10	8.877									5.17	6.84	
DISCOUNT RATE € 6.00%					470.12	162.70	38.91	5.73	49.31	4.61	128.26	96.20	4.44	56.46	74.68
UNIT REFERENCE VALUE = 1.32 (R/m³)															
UNIT COST OF WATER															
FIXED COST:															
Interest and capital repayment @ 12% per annum :															
a) Civil Infrastructure - 20 year period															
	(466.90)														
		62.508													
b) Mech./Elec equipment - 15 year period															
	(100.11)														
		14.699													
		77.207													
OPERATING COST:															
a) Maintenance :															
i. Civil works (0,25%)															
		1.167													
ii. Mech./Elec. (4%)															
		4.004													
b) Energy costs															
		6.84													
		12.012													
TOTAL ANNUAL COST:															
		<u>89.219</u>													
UNIT COST OF WATER = 1.85 (R/m³)															

Upper Wit River Diversion URVs

UPPER WIT RIVER DIVERSION SCHEME													
Scheme : 4m ³ /s Diversion into 45m High Dam (For Irrigation Exchange)													
(COSTS IN MILLION RAND, INCLUDING VAT)													
(SUPPLY IN MILLION CUBIC METERS PER YEAR)													
Yield		13 mcm/a											
Demand Growth		2% p/a											
Years to Full Supply		2.5 Years											
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS							
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR							
RIVERLANDS DAM	534.66			534.66	1.00	MAINTENANCE: (0.25% Civil) = 1.528							
INLET WEIR	14.00			14.00	1.00	(4% Mech & Elec) = 1.942 3.470 1.00							
TUNNEL (350m)	49.70			49.70	1.00	ELECTRICITY: Papenkuils							
PAPENKUILS PUMPSTATION	5.39	33.98	14.56	53.93	1.00	Power Required : 1000 KW							
SERVITUDE DAM	7.56			7.56	1.00	# Days Pumping : 100.0 days							
TOTAL CAPITAL COSTS	611.31	33.98	14.56	659.85		Unit Rate : 75.00							
						Electricity Consumption Costs : 1.80							
WATER REQUIREMENTS					COSTS								
	CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	DAM	INLET WEIR	TUNNEL	P'KUILS P/S	SERVITUD E DAM	MAINT	ELEC COSTS		
	2012	1			8.02								
	2013	2			8.02			1.35					
	2014	3			8.02			1.35	7.56				
	2015	4			255.30	7.00	49.70	25.62					
	2016	5			255.30	7.00		25.62					
	2017	6	6.50							3.47	1.80		
	2018	7	13.00							3.47	1.80		
	2019	8	13.00							3.47	1.80		
	2020	9	13.00							3.47	1.80		
	2021	10	13.00							3.47	1.80		
	2022	11	13.00							3.47	1.80		
	2023	12	13.00							3.47	1.80		
	2024	13	13.00							3.47	1.80		
	2025	14	13.00							3.47	1.80		
	2026	15	13.00							3.47	1.80		
	2027	16	13.00							3.47	1.80		
	2028	17	13.00							3.47	1.80		
	2029	18	13.00							3.47	1.80		
	2030	19	13.00							3.47	1.80		
	2031	20	13.00							3.47	1.80		
	2032	21	13.00							3.47	1.80		
	2033	22	13.00							3.47	1.80		
	2034	23	13.00							3.47	1.80		
	2035	24	13.00							3.47	1.80		
	2036	25	13.00							3.47	1.80		
	2037	26	13.00							3.47	1.80		
	2038	27	13.00							3.47	1.80		
	2039	28	13.00							3.47	1.80		
	2040	29	13.00							3.47	1.80		
	2041	30	13.00							3.47	1.80		
DISCOUNT RATE @ 6.00%					126.78	439.30	11.42	41.73	44.27	6.73	35.13	18.23	
													UNIT REFERENCE VALUE = 4.71 (R/m ³)

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(611.31)	81.842	
b) Mech./Elec equipment - 15 year period	(48.54)	7.127	88.969
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		1.528	
ii. Mech./Elec. (4%)		1.942	
b) Energy costs		1.80	5.270
TOTAL ANNUAL COST:		<u>94.239</u>	UNIT COST OF WATER = 7.25 (R/m³)

UPPER WIT RIVR DIVERSION SCHEME																
Scheme : 4m ³ /s Diversion into 45m High Dam (for use by Paarl and Wellington)																
(COSTS IN MILLION RAND, INCLUDING VAT)																
(SUPPLY IN MILLION CUBIC METERS PER YEAR)																
Yield		13 mcm/a														
Demand Growth		2% p/a														
Years to Full Supply		2.5 Years														
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS										
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR											COST FACTOR
RIVERLANDS DAM	534.66			534.66	1.00	MAINTENANCE: (0.25% Civil) = 1.822										1.00
INLET WEIR	14.00			14.00	1.00	(4% Mech & Elec) = 1.942 3.764										
TUNNEL (350m)	49.70			49.70	1.00	ELECTRICITY: Well-Paarl Papenkuils										
7,3km GRAV PIPE TO WELVANPAS	51.74			51.74	1.00	Power Required : 279 1000 KW										
SEPARATION CHAMBER	0.60			0.60	1.00	# Days Pumping : 365.0 100.0 days										
RISING MAINS	37.74			37.74	1.00	Unit Rate : 75.00 75.00										
SECONDARY PUMP STATIONS	24.98			24.98	1.00	Electricity Consumption Costs : 1.8 1.8										
PAPENKUILS PUMPSTATION	5.39	33.98	14.56	53.93	1.00											
SERVITUDE PIPELINE	2.50			2.50	1.00											
SERVITUDE DAM	7.56			7.56	1.00											
TOTAL CAPITAL COSTS	728.87	33.98	14.56	777.41												
WATER REQUIREMENTS					P/STN'S											
CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	DAM	INLET WEIR	TUNNEL	PIPELINE W/VANPAS	SEP CHAMBER	RISING MAINS	2NDARY P/STNS	PKUILS P/STN	SERVITUDE	MAINT	ELEC COSTS		
	2012	1		8.02												
	2013	2		8.02							1.35					
	2014	3		8.02					18.87	12.49	1.35	10.05				
	2015	4		255.30	7.00	49.70	25.87	0.60	18.87	12.49	25.62					
	2016	5		255.30	7.00		25.87				25.62					
	2017	6	6.50										3.76	3.63		
	2018	7	13.00										3.76	3.63		
	2019	8	13.00										3.76	3.63		
	2020	9	13.00										3.76	3.63		
	2021	10	13.00										3.76	3.63		
	2022	11	13.00										3.76	3.63		
	2023	12	13.00										3.76	3.63		
	2024	13	13.00										3.76	3.63		
	2025	14	13.00										3.76	3.63		
	2026	15	13.00										3.76	3.63		
	2027	16	13.00										3.76	3.63		
	2028	17	13.00										3.76	3.63		
	2029	18	13.00										3.76	3.63		
	2030	19	13.00										3.76	3.63		
	2031	20	13.00										3.76	3.63		
	2032	21	13.00										3.76	3.63		
	2033	22	13.00										3.76	3.63		
	2034	23	13.00										3.76	3.63		
	2035	24	13.00										3.76	3.63		
	2036	25	13.00										3.76	3.63		
	2037	26	13.00										3.76	3.63		
	2038	27	13.00										3.76	3.63		
	2039	28	13.00										3.76	3.63		
	2040	29	13.00										3.76	3.63		
	2041	30	13.00										3.76	3.63		
DISCOUNT RATE @ 6.00%				126.78	439.30	11.42	41.73	42.21	0.51	32.64	21.60	44.27	8.95	40.40	38.99	
				0.000	UNIT REFERENCE VALUE = 5.70 (R/m ³)											
UNIT COST OF WATER																
FIXED COST:																
Interest and capital repayment @ 12% per annum :																
a) Civil Infrastructure - 20 year period																
(728.87) 97.581																
b) Mech./Elec equipment - 15 year period																
(48.54) 7.127 104.707																
OPERATING COST:																
a) Maintenance :																
i. Civil works (0,25%) 1.822																
ii. Mech./Elec. (4%) 1.942																
b) Energy costs 3.63 7.397																
TOTAL ANNUAL COST:				<u>112.104</u>	UNIT COST OF WATER = 8.62 (R/m ³)											

Molenaars River Diversion URVs

MOLENAARS RIVER DIVERSION SCHEME - BULK WATER COSTS														
Scheme : Pumping Scheme of 3m ³ /s														
(COSTS IN MILLION RAND, INCLUDING VAT)														
(SUPPLY IN MILLION CUBIC METERS PER YEAR)														
Yield		11.5 mcm/a												
Demand Growth		2% p/a												
Years to Full Supply		2.4 Years												
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS								
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR								
WEIR IN MOLENAARS	28.11			28.11		MAINTENANCE: (0.25% Civil) = 1.011								
PIPELINE	335.51			335.51	1.00	(4% Mech & Elec) = 5.318 6.329 1.00								
BALANCING TANK	5.22			5.22	1.00									
OUTLET STRUCTURE	7.11			7.11	1.00									
MOLENAARS PUMPSTATION	8.20	51.66	22.14	81.99	1.00	ELECTRICITY: Molenaars Papenkuis								
BREAK PRESSURE TANK	2.28			2.28	1.00	Power Required : 2750 1750 KW								
PAPENKUILS PUMPSTATION	6.57	41.41	17.75	65.73	1.00	# Days Pumping : 85.0 100.0 days								
SERVITUDE	11.33			11.33	1.00	Unit Rate : 75.00 75.00 c/kWh								
TOTAL CAPITAL COSTS	404.34	93.07	39.89	537.29		Electricity Consumption Costs : 4.2 3.2 Rmill/yr								
						Total : 7.4								
WATER REQUIREMENTS					COSTS									
CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	MNAARS WEIR	PIPELINE	BAL TANK	OUTLET	P/S MNAARS	BREAK P TANK	PKUILS RECOVER	SERVITUDE	MAINT	ENERGY	
2012	1													
2013	2													
2014	3			14.06	161.04			41.00		32.86	11.33			
2015	4			14.06	161.04	5.22	7.11	41.00	2.28	32.86				
2016	5	6.00	4.753									6.33	3.68	
2017	6	11.50	8.593									6.33	7.36	
2018	7	11.50	8.107									6.33	7.36	
2019	8	11.50	7.648									6.33	7.36	
2020	9	11.50	7.215									6.33	7.36	
2021	10	11.50	6.807									6.33	7.36	
2022	11	11.50	6.422									6.33	7.36	
2023	12	11.50	6.058									6.33	7.36	
2024	13	11.50	5.715									6.33	7.36	
2025	14	11.50	5.392									6.33	7.36	
2026	15	11.50	5.086									6.33	7.36	
2027	16	11.50	4.799									6.33	7.36	
2028	17	11.50	4.527									6.33	7.36	
2029	18	11.50	4.271									6.33	7.36	
2030	19	11.50	4.029									6.33	7.36	
2031	20	11.50	3.801									6.33	7.36	
2032	21	11.50	3.586									6.33	7.36	
2033	22	11.50	3.383									6.33	7.36	
2034	23	11.50	3.191									6.33	7.36	
2035	24	11.50	3.011									6.33	7.36	
2036	25	11.50	2.840									6.33	7.36	
2037	26	11.50	2.679									6.33	7.36	
2038	27	11.50	2.528									6.33	7.36	
2039	28	11.50	2.385									6.33	7.36	
2040	29	11.50	2.250									6.33	7.36	
2041	30	11.50	2.122									6.33	7.36	
DISCOUNT RATE € 6.00%				121.20	24.31	291.58	4.39	5.97	70.91	1.91	56.84	10.09	69.10	77.41
UNIT REFERENCE VALUE = 5.05 (R/m³)														
UNIT COST OF WATER														
FIXED COST:														
Interest and capital repayment @ 12% per annum :														
a) Civil Infrastructure - 20 year period														
(404.34) 54.132														
b) Mech./Elec equipment - 15 year period														
(132.95) 19.520 73.652														
OPERATING COST:														
a) Maintenance :														
i. Civil works (0,25%) 1.011														
ii. Mech./Elec. (4%) 5.318														
b) Energy costs 7.36 13.686														
TOTAL ANNUAL COST:				<u>87.339</u>	UNIT COST OF WATER = 7.59 (R/m³)									

MOLENAARS RIVER DIVERSION SCHEME - BULK WATER COSTS														
Scheme : Pumping Scheme of 4m ³ /s														
(COSTS IN MILLION RAND, INCLUDING VAT)														
(SUPPLY IN MILLION CUBIC METERS PER YEAR)														
Yield		13.5 mcm/a												
Demand Growth		2% p/a												
Years to Full Supply		2.6 Years												
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS								
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR								
WEIR IN MOLENAARS	28.84			28.84	1.00	MAINTENANCE: (0.25% Civil) = 1.136								
PIPELINE	377.44			377.44	1.00	(4% Mech & Elec) = 5.904 7.039 1.00								
BALANCING TANK	6.51			6.51	1.00									
OUTLET STRUCTURE	8.14			8.14	1.00									
MOLENAARS PUMPSTATION	9.15	57.66	24.71	91.52	1.00	ELECTRICITY: Molenaars Papekuils								
BREAK PRESSURE TANK	5.58			5.58	1.00	Power Required : 3700 2000 KW								
PAPENKUILS PUMPSTATION	7.25	45.66	19.57	72.47	1.00	# Days Pumping : 75.0 100.0 days								
SERVITUDE	11.33			11.33	1.00	Unit Rate : 75.00 75.00 c/kWh								
TOTAL CAPITAL COSTS	454.24	103.31	44.28	601.83		Electricity Consumption Costs : 5.0 3.6 Rmill/yr								
						Total : 8.6								
WATER REQUIREMENTS						COSTS								
CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	MNAARS WEIR	PIPELINE	BAL TANK	OUTLET	P/S MNAARS	BREAK P TANK	PKUILS RECOVER	SERVITUDE	MAINT	ENERGY	
2012	1													
2013	2				7.55									
2014	3			14.42	181.17						11.33			
2015	4			14.42	181.17	6.51	8.14	45.76	5.58	36.24				
2016	5	7.00	5.54									7.04	4.30	
2017	6	13.50	10.09									7.04	8.60	
2018	7	13.50	9.52									7.04	8.60	
2019	8	13.50	8.98									7.04	8.60	
2020	9	13.50	8.47									7.04	8.60	
2021	10	13.50	7.99									7.04	8.60	
2022	11	13.50	7.54									7.04	8.60	
2023	12	13.50	7.11									7.04	8.60	
2024	13	13.50	6.71									7.04	8.60	
2025	14	13.50	6.33									7.04	8.60	
2026	15	13.50	5.97									7.04	8.60	
2027	16	13.50	5.63									7.04	8.60	
2028	17	13.50	5.31									7.04	8.60	
2029	18	13.50	5.01									7.04	8.60	
2030	19	13.50	4.73									7.04	8.60	
2031	20	13.50	4.46									7.04	8.60	
2032	21	13.50	4.21									7.04	8.60	
2033	22	13.50	3.97									7.04	8.60	
2034	23	13.50	3.75									7.04	8.60	
2035	24	13.50	3.53									7.04	8.60	
2036	25	13.50	3.33									7.04	8.60	
2037	26	13.50	3.15									7.04	8.60	
2038	27	13.50	2.97									7.04	8.60	
2039	28	13.50	2.80									7.04	8.60	
2040	29	13.50	2.64									7.04	8.60	
2041	30	13.50	2.49									7.04	8.60	
DISCOUNT RATE @ 6.00%				142.24	24.94	328.03	5.46	6.83	79.14	4.68	62.67	10.09	76.85	90.43
UNIT REFERENCE VALUE = 4.84 (R/m ³)														
UNIT COST OF WATER														
FIXED COST:														
Interest and capital repayment @ 12% per annum :														
a) Civil Infrastructure - 20 year period														
(454.24) 60.813														
b) Mech./Elec equipment - 15 year period														
(147.59) 21.670 82.482														
OPERATING COST:														
a) Maintenance :														
i. Civil works (0.25%) 1.136														
ii. Mech./Elec. (4%) 5.904														
b) Energy costs 8.60 15.634														
TOTAL ANNUAL COST: 98.116														
UNIT COST OF WATER = 7.27 (R/m ³)														

ELANDSPAD RIVER DIVERSION SCHEME - BULK WATER COSTS													
Scheme : Elandspad Weir Scheme of 3m ³ /s													
(COSTS IN MILLION RAND, INCLUDING VAT)													
(SUPPLY IN MILLION CUBIC METERS PER YEAR)													
Yield		8.6 mcm/a											
Demand Growth		2% p/a											
Years to Full Supply		2.1 Years											
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS							
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR							
ELANDSPAD WEIR	18.56			18.56	1.00	MAINTENANCE:		(0.25% Civil) =		1.031			
PIPELINE	361.45			361.45	1.00			(4% Mech & Elec) =		2.366		3.40	
BALANCING TANK	5.22			5.22	1.00								
OUTLET STRUCTURE	7.11			7.11	1.00								
BREAK PRESSURE TANK	2.28			2.28	1.00								
PAPENKUILS PUMPSTATION	6.57	41.41	17.75	65.73	1.00	ELECTRICITY:		Papenkuils		Power Required :		1750 KW	
SERVITUDE	11.33			11.33	1.00					# Days Pumping :		100.0 days	
TOTAL CAPITAL COSTS	412.52	41.41	17.75	471.68						Unit Rate :		75.00 c/kWh	
										Electricity Consumption Costs :		3.2 Rmill/yr	
WATER REQUIREMENTS						COSTS							
CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	E' PAD WEIR	PIPELINE	BAL TANK	OUTLET STRUCT	BK PRESS TANK	P'KUILS RECOVERY	SERVITUDE	MAINT	ENERGY	
2012	1												
2013	2				7.23								
2014	3			9.28	7.23								
2015	4			9.28	173.49								
2016	5	4.30	3.406		173.49	5.22	7.11	2.28	32.86	11.33			
2017	6	8.60	6.426						32.86		1.70	1.58	
2018	7	8.60	6.063								3.40	3.15	
2019	8	8.60	5.719								3.40	3.15	
2020	9	8.60	5.396								3.40	3.15	
2021	10	8.60	5.090								3.40	3.15	
2022	11	8.60	4.802								3.40	3.15	
2023	12	8.60	4.530								3.40	3.15	
2024	13	8.60	4.274								3.40	3.15	
2025	14	8.60	4.032								3.40	3.15	
2026	15	8.60	3.804								3.40	3.15	
2027	16	8.60	3.588								3.40	3.15	
2028	17	8.60	3.385								3.40	3.15	
2029	18	8.60	3.194								3.40	3.15	
2030	19	8.60	3.013								3.40	3.15	
2031	20	8.60	2.842								3.40	3.15	
2032	21	8.60	2.682								3.40	3.15	
2033	22	8.60	2.530								3.40	3.15	
2034	23	8.60	2.387								3.40	3.15	
2035	24	8.60	2.251								3.40	3.15	
2036	25	8.60	2.124								3.40	3.15	
2037	26	8.60	2.004								3.40	3.15	
2038	27	8.60	1.890								3.40	3.15	
2039	28	8.60	1.783								3.40	3.15	
2040	29	8.60	1.682								3.40	3.15	
2041	30	8.60	1.587								3.40	3.15	
DISCOUNT RATE @ 6.00%				90.49	16.05	314.13	4.39	5.97	1.91	56.84	10.09	35.75	33.14
													UNIT REFERENCE VALUE = 5.29 (R/m³)

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(412.52)	55.228	
b) Mech./Elec equipment - 15 year period	(59.16)	8.686	63.914
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		1.031	
ii. Mech./Elec. (4%)		2.366	
b) Energy costs		3.15	6.548
TOTAL ANNUAL COST:		70.461	UNIT COST OF WATER = 8.17 (R/m³)

ELANDSPAD RIVER DIVERSION SCHEME - BULK WATER COSTS													
Scheme : Elandspad Weir Scheme of 4m ³ /s													
(COSTS IN MILLION RAND, INCLUDING VAT)													
(SUPPLY IN MILLION CUBIC METERS PER YEAR)													
Yield		10.1 mcm/a											
Demand Growth		2% p/a											
Years to Full Supply		2.3 Years											
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS							
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR							
ELANDSPAD WEIR	19.07			19.07	1.00	MAINTENANCE:		(0.25% Civil) =		1.161			
PIPELINE	406.61			406.61	1.00			(4% Mech & Elec) =		2.609		3.77	
BALANCING TANK	6.51			6.51	1.00								
BREAK PRESSURE TANK	5.58			5.58	1.00								
OUTLET STRUCTURE	8.14			8.14	1.00								
PAPENKUILS PUMPSTATION	7.25	45.66	19.57	72.47	1.00	ELECTRICITY:		Power Required :		Papenkuils			
SERVITUDE	11.33			11.33	1.00			# Days Pumping :		2000 KW			
TOTAL CAPITAL COSTS	464.49	45.66	19.57	529.71				Unit Rate :		100.0 days			
								Electricity Consumption Costs :		75.00 c/kWh			
										3.6 Rmill/yr			
WATER REQUIREMENTS					COSTS								
CALEND . YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	E' PAD WEIR	PIPELINE	BAL TANK	BK PRESS TANK	OUTLET STRUCT	P'KUILS RECOVERY	SERVITUD E	MAINT	ENERGY	
	2012	1											
	2013	2											
	2014	3			9.54				36.24	11.33			
	2015	4			9.54			8.14	36.24				
	2016	5	5.50	4.357			6.51	5.58			1.89	1.80	
	2017	6	10.10	7.547							3.77	3.60	
	2018	7	10.10	7.120							3.77	3.60	
	2019	8	10.10	6.717							3.77	3.60	
	2020	9	10.10	6.337							3.77	3.60	
	2021	10	10.10	5.978							3.77	3.60	
	2022	11	10.10	5.640							3.77	3.60	
	2023	12	10.10	5.321							3.77	3.60	
	2024	13	10.10	5.019							3.77	3.60	
	2025	14	10.10	4.735							3.77	3.60	
	2026	15	10.10	4.467							3.77	3.60	
	2027	16	10.10	4.214							3.77	3.60	
	2028	17	10.10	3.976							3.77	3.60	
	2029	18	10.10	3.751							3.77	3.60	
	2030	19	10.10	3.538							3.77	3.60	
	2031	20	10.10	3.338							3.77	3.60	
	2032	21	10.10	3.149							3.77	3.60	
	2033	22	10.10	2.971							3.77	3.60	
	2034	23	10.10	2.803							3.77	3.60	
	2035	24	10.10	2.644							3.77	3.60	
	2036	25	10.10	2.494							3.77	3.60	
	2037	26	10.10	2.353							3.77	3.60	
	2038	27	10.10	2.220							3.77	3.60	
	2039	28	10.10	2.094							3.77	3.60	
	2040	29	10.10	1.976							3.77	3.60	
	2041	30	10.10	1.864							3.77	3.60	
DISCOUNT RATE @ 6.00%				106.63	16.49	353.38	5.46	4.68	6.83	62.67	10.09	39.67	37.88
UNIT REFERENCE VALUE = 5.04 (R/m³)													

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(464.49)	62.185	
b) Mech./Elec equipment - 15 year period	(65.22)	9.576	71.762
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		1.161	
ii. Mech./Elec. (4%)		2.609	
b) Energy costs		3.60	7.370
TOTAL ANNUAL COST:		79.132	UNIT COST OF WATER = 7.83 (R/m³)

Voëlvei Phase 1 URVs

VOELVLEI PHASE 1 - BULK WATER COSTS												
Scheme : Pumping Scheme of 6m ³ /s with Storage in Existing Voelvllei Dam												
(COSTS IN MILLION RAND, INCLUDING VAT)												
(SUPPLY IN MILLION CUBIC METERS PER YEAR)												
Yield		26 mcm/a		After Riverine and Estuary Reserves								
Demand Growth		2% p/a										
Years to Full Supply		3.2 Years										
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS						
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR						
WEIR AT LORELEI	23.48			23.48	1.00	MAINTENANCE: (0.25% Civil) = 0.440						
PUMPSTATION TO DAM	10.18	64.13	27.49	101.80	1.00	(4% Mech & Elec) = 3.665 4.104 1.00						
PIPELINE LORELEI TO DAM	129.77			129.77	1.00							
OUTLET STRUCTURE	12.30			12.30	1.00	ELECTRICITY: Lorelei						
SERVITUDE	0.08			0.75	1.00	Power Required : 2700 KW						
TOTAL CAPITAL COSTS	175.82	64.13	27.49	268.11		# Days Pumping : 120.0 days						
						Unit Rate : 75.00 c/kWh						
						Electricity Consumption Costs : 5.8 Rmill/yr						
						Total :						
WATER REQUIREMENTS					COSTS							
	CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	LORELEI WEIR	P/STN TO DAM	PIPELINE	OUTLET	SERVITUD E		MAINT	ENERGY
	2012	1					2.04					
	2013	2					2.04					
	2014	3			11.74	48.86			0.75			
	2015	4			11.74	48.86	129.77	12.30				
	2016	5	13.00	10.297							2.05	2.92
	2017	6	26.00	19.429							4.10	5.83
	2018	7	26.00	18.329							4.10	5.83
	2019	8	26.00	17.291							4.10	5.83
	2020	9	26.00	16.313							4.10	5.83
	2021	10	26.00	15.389							4.10	5.83
	2022	11	26.00	14.518							4.10	5.83
	2023	12	26.00	13.696							4.10	5.83
	2024	13	26.00	12.921							4.10	5.83
	2025	14	26.00	12.190							4.10	5.83
	2026	15	26.00	11.500							4.10	5.83
	2027	16	26.00	10.849							4.10	5.83
	2028	17	26.00	10.235							4.10	5.83
	2029	18	26.00	9.655							4.10	5.83
	2030	19	26.00	9.109							4.10	5.83
	2031	20	26.00	8.593							4.10	5.83
	2032	21	26.00	8.107							4.10	5.83
	2033	22	26.00	7.648							4.10	5.83
	2034	23	26.00	7.215							4.10	5.83
	2035	24	26.00	6.807							4.10	5.83
	2036	25	26.00	6.421							4.10	5.83
	2037	26	26.00	6.058							4.10	5.83
	2038	27	26.00	5.715							4.10	5.83
	2039	28	26.00	5.392							4.10	5.83
	2040	29	26.00	5.086							4.10	5.83
	2041	30	26.00	4.798							4.10	5.83
DISCOUNT RATE @			6.00%	273.56	20.31	88.47	108.96	10.33	0.67	0.00	43.18	61.36
UNIT REFERENCE VALUE = 1.22 R/m³												

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(175.82)	23.538	
b) Mech./Elec equipment - 15 year period	(91.62)	13.452	36.990
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		0.440	
ii. Mech./Elec. (4%)		3.665	
b) Energy costs		5.83	9.936
TOTAL ANNUAL COST:		<u>46.926</u>	UNIT COST OF WATER = 1.80 R/m³

VOELVLEI PHASE 1 - BULK WATER COSTS												
Spes Bona Alternative: Pumping Scheme of 3,2m ³ /s without Storage in Voelvlei												
(COSTS IN MILLION RAND, INCLUDING VAT) (SUPPLY IN MILLION CUBIC METERS PER YEAR)												
Yield		20 mcm/a		After Riverine and Estuary Reserves								
Demand Growth		2% p/a										
Years to Full Supply		2.9 Years										
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS						
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR						
WEIR AT SPES BONA	20.52			20.52	1.00	MAINTENANCE: (0.25% Civil) = 0.424						
PUMP STATIONS	10.18	64.13	27.49	101.80	1.00	(4% Mech & Elec) = 3.665 4.088 1.00						
PIPELINES	91.35			91.35	1.00							
SETTLING DAM (0,85 mcm)	47.19			47.19	1.00	ELECTRICITY: Power Required : 2200 KW # Days Pumping : 120.0 days Unit Rate : 75.00 c/kWh Electricity Consumption Costs : 4.75 Rmill/yr Total :						
SERVITUDE	0.21			2.05	1.00							
TOTAL CAPITAL COSTS	169.44	64.13	27.49	262.91								
WATER REQUIREMENTS						COSTS						
	CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	SP BONA WEIR	P/STNS	PIPELINES	SETTLING DAM	SERVITUDE		MAINT	ENERGY
	2012	1					1.83					
	2013	2				2.04	1.83					
	2014	3			10.26	48.86	43.85	23.60	2.05			
	2015	4			10.26	48.86	43.85	23.60				
	2016	5	10.00	7.921							2.04	2.38
	2017	6	20.00	14.945							4.09	4.75
	2018	7	20.00	14.099							4.09	4.75
	2019	8	20.00	13.301							4.09	4.75
	2020	9	20.00	12.548							4.09	4.75
	2021	10	20.00	11.838							4.09	4.75
	2022	11	20.00	11.168							4.09	4.75
	2023	12	20.00	10.536							4.09	4.75
	2024	13	20.00	9.939							4.09	4.75
	2025	14	20.00	9.377							4.09	4.75
	2026	15	20.00	8.846							4.09	4.75
	2027	16	20.00	8.345							4.09	4.75
	2028	17	20.00	7.873							4.09	4.75
	2029	18	20.00	7.427							4.09	4.75
	2030	19	20.00	7.007							4.09	4.75
	2031	20	20.00	6.610							4.09	4.75
	2032	21	20.00	6.236							4.09	4.75
	2033	22	20.00	5.883							4.09	4.75
	2034	23	20.00	5.550							4.09	4.75
	2035	24	20.00	5.236							4.09	4.75
	2036	25	20.00	4.940							4.09	4.75
	2037	26	20.00	4.660							4.09	4.75
	2038	27	20.00	4.396							4.09	4.75
	2039	28	20.00	4.147							4.09	4.75
	2040	29	20.00	3.913							4.09	4.75
	2041	30	20.00	3.691							4.09	4.75
DISCOUNT RATE @ 6.00%				210.43	17.75	88.47	79.39	40.81	1.83	0.00	43.02	50.00
UNIT REFERENCE VALUE = 1.53 R/m³												

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(169.44)	22.685	
b) Mech./Elec equipment - 15 year period	(91.62)	13.452	36.136
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		0.424	
ii. Mech./Elec. (4%)		3.665	
b) Energy costs		4.75	8.840
TOTAL ANNUAL COST:		<u>44.977</u>	UNIT COST OF WATER = 2.25 R/m³

Voëlvei Phase 2 URVs

VOELVLEI PHASE 2 - BULK WATER COSTS													
Scheme : Pumping Scheme of 6m ³ /s with Storage in 2m Raised Voelvlei Dam													
(COSTS IN MILLION RAND, INCLUDING VAT)													
(SUPPLY IN MILLION CUBIC METERS PER YEAR)													
Yield		35 mcm/a		After Riverine and Estuary Reserves									
Demand Growth		2% p/a											
Years to Full Supply		3.5 Years											
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS							
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR							
WEIR AT LORELEI	23.48			23.48	1.00	MAINTENANCE: (0.25% Civil) = 1.484							
PUMPSTATION TO DAM	10.18	64.13	27.49	101.80	1.00	(4% Mech & Elec) = 3.665 5.149 1.00							
PIPELINE LORELEI TO DAM	129.77			129.77	1.00								
OUTLET STRUCTURE	12.30			12.30	1.00								
SERVITUDE	0.08			0.75	1.00	Lorelei							
2m PARAPET WALL	303.24			303.24		Power Required : 2700 KW							
4.5km CANAL REALIGNMENT	114.61			114.61		# Days Pumping : 120.0 days							
						Unit Rate : 75.00 c/kWh							
						Electricity Consumption Costs : 5.8 Rmill/yr							
						Total :							
TOTAL CAPITAL COSTS	593.66	64.13	27.49	685.96									
WATER REQUIREMENTS					COSTS								
CALEND YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	LORELEI WEIR	P/STN TO DAM	PIPELINE	OUTLET	SERVITUD E	PARAPET WALL	KL BERG CANAL	MAINT	ENERGY	
2012	1									6.06	2.29		
2013	2									6.06	2.29		
2014	3			11.74	48.86			0.75	145.56	55.01			
2015	4			11.74	48.86	129.77	12.30		145.56	55.01			
2016	5	17.00	13.466								2.57	2.92	
2017	6	35.00	26.154								5.15	5.83	
2018	7	35.00	24.674								5.15	5.83	
2019	8	35.00	23.277								5.15	5.83	
2020	9	35.00	21.959								5.15	5.83	
2021	10	35.00	20.716								5.15	5.83	
2022	11	35.00	19.544								5.15	5.83	
2023	12	35.00	18.438								5.15	5.83	
2024	13	35.00	17.394								5.15	5.83	
2025	14	35.00	16.409								5.15	5.83	
2026	15	35.00	15.481								5.15	5.83	
2027	16	35.00	14.604								5.15	5.83	
2028	17	35.00	13.778								5.15	5.83	
2029	18	35.00	12.998								5.15	5.83	
2030	19	35.00	12.262								5.15	5.83	
2031	20	35.00	11.568								5.15	5.83	
2032	21	35.00	10.913								5.15	5.83	
2033	22	35.00	10.295								5.15	5.83	
2034	23	35.00	9.713								5.15	5.83	
2035	24	35.00	9.163								5.15	5.83	
2036	25	35.00	8.644								5.15	5.83	
2037	26	35.00	8.155								5.15	5.83	
2038	27	35.00	7.693								5.15	5.83	
2039	28	35.00	7.258								5.15	5.83	
2040	29	35.00	6.847								5.15	5.83	
2041	30	35.00	6.459								5.15	5.83	
DISCOUNT RATE @ 6.00%				367.86	20.31	88.47	108.96	10.33	0.67	263.54	99.60	54.17	61.36
UNIT REFERENCE VALUE = 1.92 R/m³													

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(593.66)	79.479	
b) Mech./Elec equipment - 15 year period	(91.62)	<u>13.452</u>	92.930
OPERATING COST:			
a) Maintenance :			
i. Civil works (0.25%)		1.484	
ii. Mech./Elec. (4%)		3.665	
b) Energy costs		<u>5.83</u>	10.981
TOTAL ANNUAL COST:		<u>103.911</u>	UNIT COST OF WATER = 2.97 R/m³

VOELVLEI PHASE 2 INCREMENTAL - BULK WATER COSTS													
Scheme : Pumping Scheme of 6m ³ /s with Storage in 2m Raised Voelvlei Dam													
(COSTS IN MILLION RAND, INCLUDING VAT)													
(SUPPLY IN MILLION CUBIC METERS PER YEAR)													
Yield		9 mcm/a		After Riverine and Estuary Reserves									
Demand Growth		2% p/a											
Years to Full Supply		2.2 Years											
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS							
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR							
WEIR AT LORELEI	0.00			0.00	1.00	MAINTENANCE: (0.25% Civil) = 1.045							
PUMPSTATION TO DAM	0.00	0.00	0.00	0.00	1.00	(4% Mech & Elec) = 0.000 1.045 1.00							
PIPELINE LORELEI TO DAM	0.00			0.00	1.00								
OUTLET STRUCTURE	0.00			0.00	1.00								
SERVITUDE	0.00			0.00	1.00	ELECTRICITY: Lorelei							
2m PARAPET WALL	303.24			303.24	1.00	Power Required : 0 KW							
4.5km CANAL REALIGNMENT	114.61			114.61	1.00	# Days Pumping : 120.0 days							
						Unit Rate : 75.00 c/kWh							
						Electricity Consumption Costs : 0.0 Rmill/yr							
						Total :							
TOTAL CAPITAL COSTS	417.85	0.00	0.00	417.85									
WATER REQUIREMENTS					COSTS								
CALEND YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	LORELEI WEIR	P/STN TO DAM	PIPELINE	OUTLET	SERVITUDE	PARAPET WALL	KL BERG CANAL	MAINT	ENERGY	
2012	1									6.06	2.29		
2013	2								6.06	2.29			
2014	3			0.00	0.00			0.00	145.56	55.01			
2015	4			0.00	0.00	0.00	0.00		145.56	55.01			
2016	5	4.50	3.564								0.52	0.00	
2017	6	9.00	6.725								1.04	0.00	
2018	7	9.00	6.345								1.04	0.00	
2019	8	9.00	5.986								1.04	0.00	
2020	9	9.00	5.647								1.04	0.00	
2021	10	9.00	5.327								1.04	0.00	
2022	11	9.00	5.026								1.04	0.00	
2023	12	9.00	4.741								1.04	0.00	
2024	13	9.00	4.473								1.04	0.00	
2025	14	9.00	4.220								1.04	0.00	
2026	15	9.00	3.981								1.04	0.00	
2027	16	9.00	3.755								1.04	0.00	
2028	17	9.00	3.543								1.04	0.00	
2029	18	9.00	3.342								1.04	0.00	
2030	19	9.00	3.153								1.04	0.00	
2031	20	9.00	2.975								1.04	0.00	
2032	21	9.00	2.806								1.04	0.00	
2033	22	9.00	2.647								1.04	0.00	
2034	23	9.00	2.498								1.04	0.00	
2035	24	9.00	2.356								1.04	0.00	
2036	25	9.00	2.223								1.04	0.00	
2037	26	9.00	2.097								1.04	0.00	
2038	27	9.00	1.978								1.04	0.00	
2039	28	9.00	1.866								1.04	0.00	
2040	29	9.00	1.761								1.04	0.00	
2041	30	9.00	1.661								1.04	0.00	
DISCOUNT RATE @ 6.00%				94.69	0.00	0.00	0.00	0.00	0.00	263.54	99.60	10.99	0.00
UNIT REFERENCE VALUE = 3.95 R/m³													

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(417.85)	55.941	
b) Mech./Elec equipment - 15 year period	(0.00)	0.000	55.941
OPERATING COST:			
a) Maintenance :			
i. Civil works (0.25%)		1.045	
ii. Mech./Elec. (4%)		0.000	
b) Energy costs		0.00	1.045
TOTAL ANNUAL COST:		<u>56.985</u>	UNIT COST OF WATER = 6.33 R/m³

Palmiet River Development URVs

RAISE LOWER STEENBRAS DAM BY 20m												
Scheme : 70m High Embankment Dam (with additional Palmiet abstraction)												
(COSTS IN MILLION RAND, INCLUDING VAT)												
(SUPPLY IN MILLION CUBIC METERS PER YEAR)												
Yield		23 mcm/a										
Demand Growth		2% p/a										
Years to Full Supply		3.1 Years										
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS						
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR						
RAISE LOWER STEENBRAS DAM	723.90			723.90	1.00	MAINTENANCE: (0.25% Civil) = 1.865						
P/STATION TO UPP STEENBRAS	4.21	26.54	11.38	42.13	1.00	(4% Mech & Elec) = 1.517 3.382 1.00						
RISING MAIN TO UPP STEENBRA	18.03			18.03	1.00	Kogelberg to Rockview						
						Power Required : 8500 KW						
						# Days Pumping : 182.0 days						
						Unit Rate : 35.00 (Off Peak) c/kWh						
TOTAL CAPITAL COSTS	746.15	26.54	11.38	784.07		Electricity Consumption Costs : 13.0 Rmill/yr						
WATER REQUIREMENTS					COSTS							
	CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	STEENBRAS DAM	PUMP STATION	RISING MAIN		MAINT	ENERGY		
	2012	1			10.86							
	2013	2			10.86							
	2014	3			234.06							
	2015	4			234.06		21.07	18.03				
	2016	5			234.06		21.07					
	2017	6	7.00	5.23					3.38	4.33		
	2018	7	7.00	4.93					3.38	4.33		
	2019	8	8.00	5.32					3.38	4.33		
	2020	9	23.00	14.43					3.38	12.99		
	2021	10	23.00	13.61					3.38	12.99		
	2022	11	23.00	12.84					3.38	12.99		
	2023	12	23.00	12.12					3.38	12.99		
	2024	13	23.00	11.43					3.38	12.99		
	2025	14	23.00	10.78					3.38	12.99		
	2026	15	23.00	10.17					3.38	12.99		
	2027	16	23.00	9.60					3.38	12.99		
	2028	17	23.00	9.05					3.38	12.99		
	2029	18	23.00	8.54					3.38	12.99		
	2030	19	23.00	8.06					3.38	12.99		
	2031	20	23.00	7.60					3.38	12.99		
	2032	21	23.00	7.17					3.38	12.99		
	2033	22	23.00	6.77					3.38	12.99		
	2034	23	23.00	6.38					3.38	12.99		
	2035	24	23.00	6.02					3.38	12.99		
	2036	25	23.00	5.68					3.38	12.99		
	2037	26	23.00	5.36					3.38	12.99		
	2038	27	23.00	5.06					3.38	12.99		
	2039	28	23.00	4.77					3.38	12.99		
	2040	29	23.00	4.50					3.38	12.99		
	2041	30	23.00	4.24					3.38	12.99		
DISCOUNT RATE @ 6.00%				199.68	611.34	34.38	15.14	0.00	34.25	113.24	0.00	
				199.68	UNIT REFERENCE VALUE = 3.48 (R/m3)							

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period	(746.15)	99.893	
b) Mech./Elec equipment - 15 year period	(37.92)	5.568	105.461
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		1.865	
ii. Mech./Elec. (4%)		1.517	
b) Energy costs		12.99	16.377
TOTAL ANNUAL COST:			121.838
			UNIT COST OF WATER = 5.30 (R/m3)

RAISE LOWER STEENBRAS DAM BY 20m AND CONSTUCT CAMPANULA DAM														
Scheme : 70m High Steenbras Embankment Dam (with additional Palmiet abstraction) and 45 m High Campanula Embankment Dam														
(COSTS IN MILLION RAND, INCLUDING VAT)														
(SUPPLY IN MILLION CUBIC METERS PER YEAR)														
Yield		33 mcm/a												
Demand Growth		2% p/a												
Years to Full Supply		3.4 Years												
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS								
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR								
RAISE LOWER STEENBRAS DAM	723.90			723.90	1.00	MAINTENANCE: (0.25% Civil) = 2.910								
P/STATION TO UPP STEENBRAS	4.21	26.54	11.38	42.13	1.00	(4% Mech & Elec) = 2.573 5.482 1.00								
RISING MAIN TO UPP STEENBRAS	18.03			18.03	1.00	Camp - Kogel Kogel - Rockview								
CAMPANULA DAM	311.22			311.22	1.00	Power Required : 1200 8500 KW								
RISING MAIN TO KOGELBERG	51.40			51.40	1.00	# Days Pumping : 365.0 182.0 days								
OUTLET STRUCTURE	1.69			1.69	1.00	Unit Rate : 70.00 35.00 c/kWh								
PUMPSTATION TO KOGELBERG	2.93	18.48	7.92	29.33	1.00	Electricity Consumption Costs : 7.4 13.0 Rmill/yr								
SERVITUDE	50.56			50.56	1.00	Total 20.4								
TOTAL CAPITAL COSTS	1163.95	45.02	19.29	1228.26										
WATER REQUIREMENTS					COSTS									
CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	STEENBRAS DAM	P/S LOW TO UPP	RISING MAIN UPP STEEN	CAMPANULA DAM	RISING MAIN KOGELBERG	OUTLET STRUCTURE	P/S CAMP TO KOGEL	SERVITUDE	MAINT	ENERGY	
	2012	1		10.86			4.67							
	2013	2		10.86			4.67							
	2014	3		234.06			100.63				50.56			
	2015	4		234.06	21.07	18.03	100.63	25.70		14.66				
	2016	5		234.06	21.07		100.63	25.70	1.69	14.66				
	2017	6	11.00	8.22								1.64	6.11	
	2018	7	24.00	16.92								3.67	13.64	
	2019	8	33.00	21.95								5.48	20.35	
	2020	9	33.00	20.70								5.48	20.35	
	2021	10	33.00	19.53								5.48	20.35	
	2022	11	33.00	18.43								5.48	20.35	
	2023	12	33.00	17.38								5.48	20.35	
	2024	13	33.00	16.40								5.48	20.35	
	2025	14	33.00	15.47								5.48	20.35	
	2026	15	33.00	14.60								5.48	20.35	
	2027	16	33.00	13.77								5.48	20.35	
	2028	17	33.00	12.99								5.48	20.35	
	2029	18	33.00	12.26								5.48	20.35	
	2030	19	33.00	11.56								5.48	20.35	
	2031	20	33.00	10.91								5.48	20.35	
	2032	21	33.00	10.29								5.48	20.35	
	2033	22	33.00	9.71								5.48	20.35	
	2034	23	33.00	9.16								5.48	20.35	
	2035	24	33.00	8.64								5.48	20.35	
	2036	25	33.00	8.15								5.48	20.35	
	2037	26	33.00	7.69								5.48	20.35	
	2038	27	33.00	7.25								5.48	20.35	
	2039	28	33.00	6.84								5.48	20.35	
	2040	29	33.00	6.46								5.48	20.35	
	2041	30	33.00	6.09								5.48	20.35	
DISCOUNT RATE @ 6.00%				311.36	611.34	34.38	15.14	262.83	41.94	1.33	23.93	45.00	51.37	190.71
				311.36	UNIT REFERENCE VALUE = 4.10 (R/m3)									

UNIT COST OF WATER			
FIXED COST:			
Interest and capital repayment @ 12% per annum :			
a) Civil Infrastructure - 20 year period			
(1163.95)		155.828	
b) Mech./Elec equipment - 15 year period			
(64.31)		9.443	165.271
OPERATING COST:			
a) Maintenance :			
i. Civil works (0,25%)		2.910	
ii. Mech./Elec. (4%)		2.573	
b) Energy costs		7.36	12.841
TOTAL ANNUAL COST:			178.112
			UNIT COST OF WATER = 5.40 (R/m3)

INCREMENTAL CAMPANULA DAM														
Scheme : Incremental 45 m High Campanula Embankment Dam														
(COSTS IN MILLION RAND, INCLUDING VAT)														
(SUPPLY IN MILLION CUBIC METERS PER YEAR)														
Yield		10 mcm/a												
Demand Growth		2% p/a												
Years to Full Supply		2.3 Years												
CAPITAL COST COMPONENTS						ANNUAL COST COMPONENTS								
	CIVIL	MECH	ELEC	TOTAL	COST FACTOR	COST FACTOR								
CAMPANULA DAM	311.22			311.22	1.00	MAINTENANCE: (0.25% Civil) = 1.045								
RISING MAIN TO KOGELBERG	51.40			51.40	1.00	(4% Mech & Elec) = 1.056 2.100 1.00								
OUTLET STRUCTURE	1.69			1.69	1.00	Camp - Kogel								
PUMPSTATION TO KOGELBERG	2.93	18.48	7.92	29.33	1.00	Power Required : 1200 KW								
SERVITUDE	50.56			50.56	1.00	# Days Pumping : 365.0 days								
TOTAL CAPITAL COSTS	417.80	18.48	7.92	444.20		Unit Rate : 70.00 c/kWh								
						Electricity Consumption Costs : 7.4 Rmill/yr								
						Total								
WATER REQUIREMENTS					COSTS									
CALEND. YEAR	YEAR	Supply (10 ⁶ m ³)	NPV of Supply	STEENBRAS DAM	P/S LOW TO UPP	RISING MAIN UPP STEEN	CAMPANULA DAM	RISING MAIN KOGELBERG	OUTLET STRUCTURE	P/S CAMP TO KOGEL	SERVITUDE	MAINT	ENERGY	
	2012	1					4.67							
	2013	2					4.67							
	2014	3					100.63				50.56			
	2015	4					100.63	25.70		14.66				
	2016	5					100.63	25.70	1.69	14.66				
	2017	6	5.00	3.74								1.05	3.68	
	2018	7	8.00	5.64								1.58	5.52	
	2019	8	10.00	6.65								2.10	7.36	
	2020	9	10.00	6.27								2.10	7.36	
	2021	10	10.00	5.92								2.10	7.36	
	2022	11	10.00	5.58								2.10	7.36	
	2023	12	10.00	5.27								2.10	7.36	
	2024	13	10.00	4.97								2.10	7.36	
	2025	14	10.00	4.69								2.10	7.36	
	2026	15	10.00	4.42								2.10	7.36	
	2027	16	10.00	4.17								2.10	7.36	
	2028	17	10.00	3.94								2.10	7.36	
	2029	18	10.00	3.71								2.10	7.36	
	2030	19	10.00	3.50								2.10	7.36	
	2031	20	10.00	3.31								2.10	7.36	
	2032	21	10.00	3.12								2.10	7.36	
	2033	22	10.00	2.94								2.10	7.36	
	2034	23	10.00	2.78								2.10	7.36	
	2035	24	10.00	2.62								2.10	7.36	
	2036	25	10.00	2.47								2.10	7.36	
	2037	26	10.00	2.33								2.10	7.36	
	2038	27	10.00	2.20								2.10	7.36	
	2039	28	10.00	2.07								2.10	7.36	
	2040	29	10.00	1.96								2.10	7.36	
	2041	30	10.00	1.85								2.10	7.36	
DISCOUNT RATE @ 6.00%				96.11	0.00	0.00	0.00	262.83	41.94	1.33	23.93	45.00	20.11	70.46
				96.11	UNIT REFERENCE VALUE = 4.84 (R/m3)									
UNIT COST OF WATER														
FIXED COST:														
Interest and capital repayment @ 12% per annum :														
a) Civil Infrastructure - 20 year period														
	(417.80)			55.935										
b) Mech./Elec equipment - 15 year period														
	(26.39)			3.875		59.810								
OPERATING COST:														
a) Maintenance :														
i. Civil works (0,25%)														
				1.045										
ii. Mech./Elec. (4%)														
				1.056										
b) Energy costs														
				7.36		9.459								
TOTAL ANNUAL COST:					69.269	UNIT COST OF WATER = 6.93 (R/m3)								