Table C.14: Future water pump stations required					
Distribution System	Recommendations included in the Water Master Plan	Year	Capacity (l/s)	Head (m)	Cost (R Million)
bos					
Buffeljags Bay	No pump stations	-	-	-	-
Total					14.515

RESERVOIR INFRASTRUCTURE

Overstrand Municipality's overall storage factors of the reservoirs for the various towns for 2015/2016, based on 1 x PDD (24 hours storage capacity), are 1.52 for Buffels River, 2.00 for Kleinmond, 1.71 for Greater Hermanus, 1.29 for Stanford, 1.34 for Greater Gansbaai, 2.14 for Pearly Beach, 1.34 for Baardskeerdersbos and 2.67 for Buffeljags Bay.

Even though the Municipality's overall storage capacity might be adequate there might be some distribution zones within the Municipality's networks with inadequate storage capacity, as identified through the Water Master Plan (June 2016) and indicated in the table below:

Table C.15: Future reservoirs required				
Distribution System	Recommendations included in the Water Master Plan	Year	Capacity (Ml)	Cost (R Million)
Buffels River	Required at the existing Sunny Seas reservoir site to increase reservoir storage for Betty's Bay (TWL = 89m).	2025	1.000	3.766
	Required at the existing Pringle Bay reservoir site to increase reservoir storage for Pringle Bay (TWL = 67m).	2017	3.000	7.854
	Required at the Voorberg reservoir site to increase reservoir storage for Betty's Bay (TWL = 66m).	2018	3.500	8.844
Kleinmond	Proposed at the existing Kleinmond Protearand reservoir site when AADD exceeds 4000 kl/d (TWL = 91m).	2035	1.500	4.949
Greater Hermanus	Proposed at the existing Fisherhaven LL reservoir site to augment reservoir storage for the Fisherhaven LL reservoir zone (TWL = 60m).	2030	3.500	8.844
	Proposed at the existing Hawston LL reservoir site to augment reservoir storage for Hawston (TWL = 66m).	2030	3.000	7.854
	Proposed at the existing Vermont reservoir site to augment reservoir storage for the Vermont reservoir zone (TWL = 83m)	2025	1.000	3.766
	Proposed at the existing Onrus reservoir site to augment reservoir storage for Onrus (TWL = 78m).	2020	1.500	4.949
	Proposed at the existing Onrus Manor reservoir site to augment reservoir storage in the Onrus Manor reservoir zone (TWL = 144m)	2025	0.500	2.408
	Required to increase reservoir storage for Kidbrooke Place (Cost to developer) (TWL = 85m).	2020	0.300	0.000
	Proposed at the existing Sandbaai reservoir site to augment reservoir storage for Sandbaai (TWL = 65m).	2017	3.000	7.854
	Proposed at the existing Northcliff reservoir site to augment reservoir storage in the Northcliff reservoir zone (TWL = 75m).	2030	0.300	1.743
	Proposed at the existing Mount Pleasant reservoir site to augment reservoir storage in the Mount Pleasant reservoir zone (Currently under construction) (TWL = 87m).	2016	1.000	0.000
	Proposed at the existing Fisherhaven HL reservoir site to augment reservoir storage for the Fisherhaven HL reservoir zone (TWL = 108m).	2018	6.000	12.852
	Proposed at the existing Hermanus 1 & 2 reservoir site to augment reservoir storage for the zone when AADD for Hermanus reservoir zone exceeds 5 000 kl/d (TWL = 61m).	2030	2.000	5.964
Stanford	Proposed at the existing Stanford reservoir site to augment reservoir storage for Stanford when the AADD for the town exceeds 1 350 kl/d (TWL = 85m)	2025	1.500	4.949
Greater Gansbaai	Proposed at the existing Franskraal reservoir site to augment reservoir storage for Franskraal (TWL = 59m).	2025	2.000	5.964
	Proposed at the existing Kleinbaai reservoir site to augment reservoir storage for Kleinbaai, Romans Bay and the Birkenhead area (TWL = 61m).	2025	3.000	7.854
	Proposed at the existing Gansbaai reservoir site to augment reservoir storage for Gansbaai - phase 1 (TWL = 63m).	2018	4.000	9.744

Table C.15: Future reservoirs required				
Distribution System	**Recommendations included in the Water Master Plan**	**Year**	**Capacity (Ml)**	**Cost (R Million)**
	Proposed at the existing Gansbaai reservoir site to augment reservoir storage for Gansbaai - phase 2 (TWL = 63m).	2030	4.000	9.744
	Proposed at the existing De Kelders reservoir site to augment reservoir storage for De Kelders (TWL = 98m).	2035	1.000	3.766
	Additional reservoir storage capacity for Franskraal LL zone when future areas GG31 & the lower lying erven of future development area GG33 develop (TWL = 69m).	2030	7.000	14.406
	New Franskraal HL reservoir when future areas GG32 and higher lying erven of GG33 develop (TWL = 120m).	2030	5.500	12.089
Pearly Beach	Proposed at the existing Pearly Beach reservoir site to augment reservoir storage when existing AADD reaches 1 000 kl/d (TWL = 19m).	2030	1.500	4.949
Baardskeerders-bos	No additional reservoir storage capacity is required.	-	-	-
Buffeljags Bay	No additional reservoir storage capacity is required.	-	-	-
Total				**155.112**

WATER AND SEWER RETICULATION INFRASTRUCTURE

The Water Master Plan (June 2016) has indicated that based on the most likely land-use development scenario, the following future water reticulation infrastructure components will be necessary.

Table C.16: Future water reticulation infrastructure required
BUFFELS RIVER
Proposed distribution zones • The only changes to the existing distribution zones are that the water network of the higher lying erven in the Betty's Bay Voorberg reservoir zone is rezoned and incorporated in a new Betty's Bay booster zone.
Proposed future system and required works The existing Buffels River water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas. • A few distribution pipelines are required to reinforce water supply within the Pringle Bay reservoir, Voorberg reservoir and Sunny Seas reservoir distribution networks. • A few pipelines and valves are proposed in order to implement the Betty's Bay booster zone.
KLEINMOND
Proposed distribution zones • The Protearand reservoir zone is increased to accommodate future development areas within the zone. • A new booster pumping zones are proposed for higher lying future development area KM4. • Zone adjustments to the Overhills booster zone to improve pressures in low pressure areas.
Proposed future system and required works The existing Kleinmond water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas. • A few distribution pipelines are required to reinforce water supply within the Kleinmond distribution networks. • New distribution pipelines are proposed for when future development areas KM2, KM3 and KM4 develop. • A new pipeline and valves are proposed in order to implement zone boundary changes to the Kleinmond Overhills booster zone
GREATER HERMANUS
Proposed distribution zones • The boundaries of the existing Fisherhaven HL reservoir zone are increased to accommodate future development areas GH1, GH5.1 and GH5.2 • A new Fisherhaven HL PRV zone (supplied from the existing Fisherhaven HL reservoir zone via a PRV is proposed to accommodate future development areas GH6.3 - 6.5. The setting of the PRV should be set at 63 m. • The boundaries of the Northcliff reservoir zone are increased to accommodate some of the higher lying erven of the Hermanus reservoir zone. • The boundaries of the existing reservoir zones are increased to accommodate future development areas in Greater Hermanus.
Proposed future system and required works The existing Greater Hermanus water distribution system has insufficient capacity to supply the future water demands for the fully

Table C.16: Future water reticulation infrastructure required
occupied scenario and the additional future development areas. • A few distribution pipelines are required to reinforce water supply within the Greater Hermanus distribution network. • New distribution pipelines are proposed to supply future development areas with water when they develop. • A new inter-connection pipeline between the Fisherhaven LL reservoir zone and the Hawston reservoir is proposed as an emergency connection when future development area GH3 develops. • A new PRV in the future Fisherhaven HL reservoir zone is proposed in order to manage static pressures in this future zone. • Rezoning between the Northcliff reservoir and Hermanus reservoir zones is proposed.
STANFORD
Proposed distribution zones • The existing Stanford PRV zone is increased to accommodate a larger portion of the existing Stanford reservoir zone. • The boundaries of the existing zones are increased to accommodate future development areas in Stanford.
Proposed future system and required works • A few distribution pipelines are required to reinforce water supply within the Stanford distribution network. • New distribution pipelines are proposed for when future development areas SF1 to SF3 and SF7 develop.
GREATER GANSBAAI
Proposed distribution zones • A new Gansbaai booster zone is proposed to accommodate the higher lying erven of future development area GG8.2. • A new Romansbaai booster zone is proposed to accommodate future development area GG30. • A new Franskraal HL reservoir zone is proposed to accommodate future development area GG32 and the higher lying erven of future development area GG33. • The boundaries of the existing reservoir zones are increased to accommodate future development areas in Greater Gansbaai.
Proposed future system and required works The existing Greater Gansbaai water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas. • A few distribution pipelines are required to reinforce water supply within the Greater Gansbaai distribution network. • New distribution pipelines are proposed to supply future development areas with water when they develop. • In De Kelders a dedicated supply pipeline from the reservoirs to the network is proposed. • It is proposed that when the Birkenhead area in Kleinbaai is serviced with a formal water network, a secondary pipeline between Birkenhead and the existing Kleinbaai network is constructed along the coastline in order to improve network redundancy and conveyance in the area.
PEARLY BEACH
Proposed distribution zones • The boundaries of the existing distribution zones are increased to accommodate future development areas in Pearly Beach.
Proposed future system and required works The existing Pearly Beach water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas. • A few distribution pipelines are required to reinforce water supply within the Pearly Beach distribution network and new distribution pipelines are proposed to supply water to anticipated future development areas.

The Sewer Master Plan (June 2016) has indicated that based on the most likely land-use development scenario, the following future sewer reticulation infrastructure components will be necessary.

Table C.17: Future sewer reticulation infrastructure required

BUFFELS RIVER

- A new sewer reticulation system is proposed for the towns of Rooi Els, Pringle Bay and Betty's Bay in the Buffels River area, which are currently serviced by septic tanks.
- In Rooi Els 4 x new future PS drainage areas are proposed that pumps the sewage of Rooi Els locally and eventually to a proposed Rooi Els Main bulk PS.
- In Pringle Bay 3 x new future PS drainage areas are proposed that pumps the sewage of Pringle Bay locally and eventually to a proposed Pringle Bay Main bulk PS.
- In Betty's Bay 8 x new future PS drainage areas are proposed that pumps the sewage of Betty's Bay locally and eventually to 3 x proposed Betty's Bay Main bulk PS's.

A new bulk sewage pumping system is proposed for the Buffels River area where sewage from the proposed Rooi Els Main PS is pumped to the Pringle Bay Main PS. From the Pringle Bay Main PS to the Betty's Bay Main PS no. 1, from the Betty's Bay Main PS no. 1 to the Betty's Bay Main PS no. 2 and from the Betty's Bay Main PS no. 2 to the Betty's Bay Main PS no. 3. It is proposed that the sewage of the Buffels River area is then pumped from the Betty's Bay Main PS no. 3 directly to the existing Kleinmond WWTP.

KLEINMOND

- The boundaries of the existing drainage areas in Kleinmond are increased to accommodate proposed future developments and existing unserviced erven that fall within these drainage areas.
- Upgrading of the Kleinmond PS no. 4 is proposed when the existing PS reaches capacity.
- A few existing outfall sewers require upgrading by replacement with larger sized future sewers.
- New outfall sewers are proposed to accommodate future development areas and to service the existing unserviced erven in Kleinmond.

GREATER HERMANUS

- The boundaries of the existing drainage areas in the Hermanus WWTP and Hawston WWTP sewer systems are increased to accommodate proposed future development areas and existing unserviced erven that fall within these drainage areas.
- In Fisherhaven new future PS drainage areas GH1 & GH2 are proposed for the areas in Fisherhaven that cannot gravitate to the existing Fisherhaven PS. New PS's and rising mains should be constructed for these new drainage areas that discharge into the existing Fisherhaven PS drainage area.
- New future PS GH3, GH4, GH5, GH6, GH7 and GH8 drainage areas are proposed for future development areas GH4, GH6.2 - GH6.6, GH19, GH24, GH49 and the existing unserviced erven in Hawston that cannot gravitate to the existing Hawston WWTP drainage area. New PSs and rising mains should be constructed for these new drainage areas. Future PSs GH7 & GH8 should discharge into the proposed future PS GH4 drainage area. Future PSs GH4 and GH5 should discharge into the existing Hawston WWTP drainage area. It is proposed that future PS GH3 pumps directly to the existing Meer-en-See PS 3 and that future PS GH6 should pump directly into the existing Hawston WWTP.
- A new future PS GH11 drainage area is proposed for the lower lying erven of future development area GH1 that cannot gravitate to the existing Hawston WWTP drainage area. A new PS and rising main should be constructed for this new drainage area that discharges into the existing Hawston WWTP drainage area.
- In Hermanus new future PS GH9 and GH10 drainage areas are proposed for the existing unserviced erven in Westcliff that cannot gravitate to the existing infrastructure of the Hermanus sewer reticulation system. New PSs and rising mains should be constructed for these 2 new drainage areas. Future PS GH10 should discharge into the proposed future PS GH9 drainage area and future PS GH9 should discharge into the existing Whale Rock PS drainage area.
- New future PS GH12, GH13 & GH14 drainage areas are proposed for future development areas GH30, GH44 & GH45. New PSs and rising mains should be constructed for these 3 new drainage areas. Future PSs GH13 and GH14 should discharge into the proposed future PS GH12 drainage area and future PS GH12 should discharge into the existing WWTP Main PS drainage area.
- A new future PS GH15 drainage area is proposed for the lower lying erven of future development area GH6.1 that cannot gravitate to the existing Onrus Main PS drainage area. A new PS and rising main should be constructed for this new drainage area that discharges into the existing Onrus Main PS drainage area.
- Upgrading of the Fisherhaven, Meer-en-See 3, Onrus Main, Sandbaai, Whale Rock and WWTP Main PSs are proposed when the existing PSs reaches capacity.
- A few existing outfall sewers require upgrading by replacement with larger sized future sewers.
- New outfall sewers are proposed to accommodate future development areas and to service the existing unserviced erven in the Greater Hermanus area.

STANFORD

- The boundaries of the existing drainage areas in Stanford are increased to accommodate proposed future development areas and existing unserviced erven that fall within these drainage areas.
- New future PS S1, S2 and S4 drainage areas are proposed for the existing unserviced erven in Stanford that cannot gravitate to the existing infrastructure of the Stanford sewer reticulation system. New PSs and rising mains should be constructed for these 3 new drainage areas. Future PS S1 should discharge into the existing Stanford Gravity drainage area, future PS S4 should discharge into the proposed drainage future PS S2 drainage area and future PS S2 should discharge into the existing Stanford PS drainage area.

Table C.17: Future sewer reticulation infrastructure required
• A new future PS S3 drainage area is proposed for future development area SF2 and a portion of future development area SF3. A new PS and rising main should be constructed for this new drainage area that discharges into the existing Stanford PS drainage area. • A few existing outfall sewers require upgrading by replacement with larger sized future sewers. • New outfall sewers are proposed to accommodate future development areas and to service the existing unserviced erven in Stanford.
GREATER GANSBAAI
• A new sewer reticulation system is proposed for the towns of De Kelders and Franskraal in the Greater Gansbaai area, which are currently serviced by septic tanks. In Gansbaai and Kleinbaai only a portion of the existing erven are serviced with a full waterborne sanitation system, and new infrastructure is proposed to service these areas in future. • In De Kelders 5 x new future PS drainage areas are proposed that pumps the sewage of De Kelders locally and eventually to a proposed De Kelders Main bulk PS. • In Gansbaai new future PS GB1 and GB4 drainage areas are proposed for the existing unserviced erven in Gansbaai that cannot gravitate to the existing infrastructure of the existing Gansbaai sewer reticulation system. New PSs and rising mains should be constructed for these 2 new drainage areas. Future PS GB1 should discharge into the existing Gansbaai Hawe PS drainage area and future PS GB4 should discharge into the existing Gansbaai WWTP Gravity drainage area. • A new future PS GB2 drainage area is proposed for future development area GG9. A new PS and rising main should be constructed for this new drainage area that discharges directly into the existing Kolgans no. 2 PS. • A new future PS GB3 drainage area is proposed for future development area GG10.1. A new PS and rising main should be constructed for this new drainage area that discharges into the existing Gansbaai WWTP Gravity drainage area. • In Kleinbaai new future PS KB1, KB2 and KB3 drainage areas are proposed. It is proposed that the existing conservancy tanks are decommissioned in future. Conservancy tank no. 1 should be accommodated in the future PS KB1 drainage area and conservancy tanks no. 2 & 3 in the future PS KB2 drainage area. New PSs and rising mains should be constructed for these new drainage areas. Future PSs KB1 and KB3 should discharge into the future PS KB2 drainage area and future PS KB2 should pump the sewage of Kleinbaai to a Kleinbaai Main bulk PS. • New future PS KB4 and KB5 drainage areas are proposed for future development area GG25 (Birkenhead area). New PSs and rising mains should be constructed for these new drainage areas. Future PS KB5 should discharge into the future PS KB4 drainage area and future PS KB4 should discharge into the future PS KB1 drainage area in Kleinbaai. • In Franskraal 3 x new future PS drainage areas are proposed that pumps the sewage of Franskraal locally and eventually to the proposed Kleinbaai Main bulk PS. • The boundaries of the existing drainage areas in Gansbaai and Kleinbaai are increased to accommodate proposed future development areas and existing unserviced erven that fall within these drainage areas. • Upgrading of the existing Kolgans no. 2 PS is proposed when the existing PS reaches capacity. • A few existing outfall sewers in Gansbaai require upgrading by replacement with larger sized future sewers. • New outfall sewers are proposed to accommodate future development areas and to service the existing unserviced erven in the Greater Gansbaai area. • A new bulk sewage pumping system is proposed for the Greater Gansbaai area where sewage from the proposed De Kelders Main PS is pumped to the existing Gansbaai Hawe PS and sewage from the proposed Kleinbaai Main PS is pumped directly to the Gansbaai WWTP. Upgrading of the Gansbaai Hawe PS is proposed when sewage is pumped from De Kelders to Gansbaai.
PEARLY BEACH
• The boundaries of the existing Pearly Beach PS1 drainage area are increased to accommodate future development area PB2. • New future PS P1, P2, P3 and P4 drainage areas are proposed for the existing unserviced erven in Pearly Beach and future development areas PB1.3, PB3 and PB4. New PSs and rising mains should be constructed for these new drainage areas. • It is proposed that Future PS P2 and Future PS P3 discharge into the future PS P1 drainage area, and that sewage from the future PS P1 drainage area is pumped directly to the existing Pearly Beach oxidation ponds. • It is proposed that the existing Pearly Beach PS1 (which currently pumps to an existing conservancy tank) pumps sewage in future directly to the proposed future PS P4 drainage area. Sewage should then be pumped from the proposed Future PS P4 to the proposed future PS P3 drainage area. • New outfall sewers are proposed to accommodate future development areas and to service the existing unserviced erven in Pearly Beach.
BAARDSKEERDERSBOS
• A new sewer reticulation system is proposed for the town of Baardskeerdersbos, which are currently serviced by septic tanks. • It is proposed that sewer pipes gravitate to a proposed package plant or conservancy tank. A more detailed investigation will be required to determine the position of the proposed package plant or conservancy tank.
BUFFELJAGS BAY
• A new sewer reticulation system is proposed for the town of Buffeljags Bay, which are currently serviced by septic tanks. • It is proposed that sewer pipes gravitate to a proposed conservancy tank for Buffeljags Bay. A more detailed investigation will be required to determine the position of the proposed conservancy tank.

SEWER PUMP STATIONS

The Sewer Master Plan (June 2016) has indicated that based on the most likely land-use development scenario, it will be necessary for the following new sewer pump stations, as well as upgrading of the existing sewer pump stations:

Table C.18: Future sewer pump stations required

Drainage System	Recommendations included in the Sewer Master Plan	Year	Cost (R Million)
Buffels River	New Future Rooi Els No.1 pump station	2030	0.480
	New Future Rooi Els No.2 pump station	2030	0.508
	New Future Rooi Els No.3 pump station	2030	0.545
	New Future Rooi Els No.4 pump station	2030	0.480
	New Future Pringle Bay No.1 pump station	2025	0.754
	New Future Pringle Bay No.2 pump station	2025	0.619
	New Future Pringle Bay No.3 pump station	2025	0.481
	New Future Betty's Bay No.1 pump station	2020	0.481
	New Future Betty's Bay No.2 pump station	2020	0.843
	New Future Betty's Bay No.3 pump station	2020	0.619
	New Future Betty's Bay No.4 pump station	2020	0.509
	New Future Betty's Bay No.5 pump station	2020	0.481
	New Future Betty's Bay No.6 pump station	2020	0.481
	New Future Betty's Bay No.7 pump station	2020	0.545
	New Future Betty's Bay No.8 pump station	2020	0.481
	New Rooi Els Main pump station (Pump from Rooi Els to Pringle Bay)	2030	0.573
	New Pringle Bay Main pump station (Pump from Pringle Bay to Betty's Bay)	2025	0.931
	New Betty's Bay Main pump station No.1 (Pump from Betty's Bay to Kleinmond WWTW)	2020	1.327
	New Betty's Bay Main pump station No.2 (Pump from Betty's Bay to Kleinmond WWTW)	2020	1.454
	New Betty's Bay Main pump station No.3 (Pump from Betty's Bay to Kleinmond WWTW)	2020	1.576
Kleinmond	Upgrade existing Harbour PS when it reaches capacity	2020	0.098
	Upgrade existing Harbour PS when it reaches capacity	2030	0.263
Greater Hermanus	Upgrade existing Fisherhaven PS when it reaches capacity	2030	0.159
	New PS for Fisherhaven	2020	0.481
	New PS for Fisherhaven	2020	0.518
	New PS when future area GH49 develops (Cost for Developer)	2020	-
	New PS when future area GH4 develops	2030	0.709
	New PS for Hawston	2025	0.709
	New PS for Hawston	2025	0.490
	New PS when future area GH6.2 develops	2020	0.385
	New PS when future areas GH6.1 and HG6.4 develop	2020	0.619
	Upgrade existing Onrus Main PS when it reaches capacity	2025	0.285
	Upgrade existing Sandbaai PS when it reaches capacity	2025	0.159
	New PS for Hermanus	2025	0.480
	New PS for Hermanus	2025	0.499
	Upgrade existing WWTP Main PS when it reaches capacity. Investigate existing capacity and operation of system from WWTW Main PS to Hermanus WWTW first.	2020	0.255
	New PS when lower lying erven of future area GH1 develops (Cost for Developer)	2035	-
	Upgrade existing Meerensee No.3 PS when it reaches capacity. Investigate existing capacity first.	2020	0.134
	Upgrade existing Whale Rock PS in order to reach scouring velocity through rising main.	2017	0.835
	New PS when future areas GH43 and GH44 develop	2030	0.573
	New PS when future area GH43 develop (Cost for Developer)	2030	-
	New PS when future areas GH43 and GH44 develop	2030	0.481
	New PS when future area GH6.1 develop (Cost for Developer)	2021	-
Stanford	New PS for Stanford South	2025	0.481
	New PS for Stanford North	2018	0.518
	New PS for Stanford North	2030	0.481

Table C.18: Future sewer pump stations required			
Drainage System	Recommendations included in the Sewer Master Plan	Year	Cost (R Million)
	New PS for Stanford North	2020	0.481
Greater Gansbaai	New PS for De Kelders	2025	0.385
	New PS for De Kelders	2025	0.527
	New PS for De Kelders	2020	0.664
	New PS for De Kelders	2020	0.799
	New PS for De Kelders	2025	0.481
	New PS for Gansbaai	2025	0.509
	New PS for Gansbaai	2025	0.385
	Upgrade existing Kolgans No.2 PS when it reaches capacity, verify existing pump capacity first.	2025	0.120
	New PS when future areas GG10 and GG11 develop	2018	0.573
	New PS for Gansbaai	2020	0.481
	New PS for Kleinbaai	2026	0.619
	New PS for Kleinbaai	2025	0.843
	New PS for Kleinbaai	2025	0.481
	New PS for Franskraal	2030	0.754
	New PS for Franskraal	2030	0.664
	New PS for Franskraal	2030	0.591
	New PS for Birkenhead drainage area	2030	0.499
	New PS for Birkenhead drainage area	2030	0.385
	New PS when lower lying erven of Perlemoenpunt develop	2030	0.527
	New PS when future areas GG10.2 and GG11.2 develop	2030	0.499
	New PS for Franskraal	2030	0.545
	New PS for Franskraal	2030	0.499
	New PS when future area GG31 develops	2035	0.619
	New PS when future area GG31 develops	2035	0.527
	New PS when future area GG32 and GG33 develop	2035	1.200
	New PS when future area GG33 develops	2035	1.156
	New PS required to pump sewage from Kleinbaai and Franskraal to Gansbaai WWTP	2025	1.658
	New PS required to pump sewage from De Kelders to Gansbaai Hawe PS	2020	0.888
	Upgrade existing PS when sewage from De Kelders is pumped to Gansbaai	2025	0.240
Pearly Beach	New PS for Pearly Beach	2025	0.709
	New PS for Pearly Beach	2025	0.481
	New PS for Pearly Beach	2030	0.619
	New PS for Pearly Beach	2030	0.545
Total			**44.733**

WASTE WATER TREATMENT INFRASTRUCTURE

The table below gives a summary of the existing capacities and current flows at each of the WWTWs (Ml/d).

Table C.19: Existing capacities and flows at each of the WWTWs (Ml/d)					
WWTW	Existing Hydraulic Capacity	Peak Daily Flow (Dec 2015 / January 2016)	Peak Month Average Daily Flow	Average Daily Flow (July 2015 – June 2016)	Average Wet Weather Flow (Jun'16, Jul'15, Aug'15)
Kleinmond	2.000	1.827	1.645 (Aug'15)	1.233	1.425
Hawston	1.000	0.533	0.415 (Jun'16)	0.349	0.351
Hermanus	12.000	8.270	7.170 (Jul'16)	6.305	6.706
Stanford	0.500	0.793	0.677 (Jul'16)	0.593	0.630
Gansbaai	2.000	8.134	0.837 (Mar'16)	0.710	0.644
Eluxolweni	0.259	Flows not yet available			

The capacity of the Hermanus WWTW was upgraded from 7.3 Ml/d to 12 Ml/d at the end of 2012. The upgrading included a new inlet works, refurbishment of the existing aeration and settling tanks, new anaerobic and anoxic basins and settling tank, mechanical sludge dewatering and a new chlorination system. The sludge handling facilities at the Kleinmond and Gansbaai WWTW were also upgraded during 2012/2013. The capacity of the Stanford WWTW will be upgraded during 2017/2018.

Kleinmond WWTW: The 2013 Green Drop score for the WWTW was 77.61% and the wastewater risk rating decreased from 47.1% in 2013 to 41.2% in 2014. The recommendations included in the 2016 Process Audit Report for the Kleinmond WWTW were as follows:

- The flow meter should be calibrated annually and the Calibration Certificate should be kept on site.
- Install an outflow meter.
- Oxygen transfer tests should be conducted to establish the delivery of the aerators.
- All aerators should run for 24 hours per day at present loading rates.
- Control the MLSS concentration in the range 4000-6000 mg TSS/l, as at present.
- The Operator should monitor the sludge settleability daily and maintain a constant Mixed Liquor Suspended Solids concentration, as at present.
- The sludge mass must be controlled at the prescribed monthly recommendations.
- To successfully maintain a viable biological population and to maintain the proper concentration of solids, the system requires continuous observation and monitoring by the Operator, as at present.
- Repair the chlorine dosing system.
- Maintain 0.40 mg/l Free Chlorine in the final effluent at all times to ensure complete disinfection.
- Site should be fenced in.

Hawston WWTW: The WWTW received a Green Drop award in 2013 (Green Drop score of 90.03%). The wastewater risk rating increased from 29.4% in 2013 to 52.9% in 2014. The recommendations included in the 2016 Process Audit Report for the Hawston WWTW were as follows:

- The flow meters at the inlet and the outlet should be calibrated annually.
- The flow meter readings should be evaluated relative to the raw sewage pump hours and pump capacities.
- Oxygen Transfer Tests should be conducted to establish the delivery of the aerators and the inlet from meter readings should be confirmed in order to establish the exact organic load imposed on the system.
- Excess sludge should be wasted regularly in order to control the MLSS concentration in the range 4000-6000 mg TSS/l.
- The Operator should monitor the sludge settleability daily and maintain a constant mixed liquor suspended solids concentration.
- To successfully maintain a viable biological population and to maintain the proper concentration of solids, the system requires continuous observation and monitoring by the Operator.
- Increase sludge wastage and maintain an adequate sludge wastage programme.
- Replace sand on drying beds.
- Ensure 0.25 mg/l Free Chlorine in the final effluent at all times to ensure satisfactory disinfection.
- Investigate the origin of the high Conductivity in the influent.

Hermanus WWTW: The WWTW received two consecutive Green Drop awards in 2012 and 2013 (Green Drop score of 91.17% in 2013). The wastewater risk rating decreased from 45.5% in 2013 to 40.9% in 2014. The recommendations included in the 2016 Process Audit Report for the Hermanus WWTW were as follows:

- Investigate the high difference between the inlet and outlet flow meters.
- Investigate the origin of the high Conductivity in the influent.
- Maintain the present mode of operation.
- Excess sludge should be wasted regularly in order to control the MLSS concentration in the range 4000 – 6000 mg TSS/l.
- The Operator should monitor the sludge settleability daily and maintain a constant mixed liquor suspended solids concentration.
- Sludge age is typically about 20 – 30 days in activated sludge plants at high (>95%) COD removal efficiencies. A long sludge area is required, at which nitrification is generally assured and a relatively stable sludge is generated. Loading rates are inversely related to sludge age.
- To successfully maintain a viable biological population and to maintain the proper concentration of solids, the system requires continuous observation and monitoring by the Operator.
- Sludge management should receive attention. Increase sludge wastage and maintain an adequate sludge wastage programme.
- Replace sand on drying beds and remove all weeds from drying beds.
- Maintain 0.25 mg/l Free Chlorine at all times.
- All Process Controllers must be registered with DWS.
- A Visitors Register should be implemented.

Stanford WWTW: The WWTW received a Green Drop award in 2013 (Green Drop Score of 93.39%). The wastewater risk rating stayed the same at 29.4% in 2013 and 2014. The recommendations included in the 2016 Process Audit Report for the Stanford WWTW were as follows:

- Investigate the origin of the influent containing high Conductivities.
- Grit should be removed from the grit channels daily and disposed of at the landfill site.
- Investigate the operation of the outflow meter.
- Investigate the raw sewage pump's location.
- Oxygen transfer tests should be conducted to establish the delivery of the aerators.
- Increase the present ATML recycle programme to assist with denitrification.
- Sludge wastage should be controlled in order to maintain a sludge age of at least 20-25 days.
- Clean out the two sludge lagoons.
- Repair the sludge feed meter.
- Ensure 0.25 mg/l Free Chlorine in the final effluent at all times, as at present.
- Revamp the office / control room and ensure proper space / shelving for records.
- No Daily Maintenance or Incident Report file visible on site. This should be readily available.
- Register staff as Process Controllers with DWS.
- Ensure that a classified Process Controller is on site per shift.
- Implement a Visitors Register in order to control access to the WWTW.
- Keep safety minutes on site.

- Install an eye wash / shower facility.

Gansbaai WWTW: The WWTW received a Green Drop award in 2013 (Green Drop score of 91.76%). The wastewater risk rating increased from 35.3% in 2013 to 41.2% in 2014. The recommendations included in the 2016 Process Audit Report for the Gansbaai WWTW were as follows:

- Investigate the origin of the periodic high inlet Conductivity.
- The inlet and outlet flow meter should be calibrated annually and a Calibration Certificate should be kept on site.
- Maintain present mode of operation.
- Repair the brush aerators.
- The amount of sludge wasted should be recorded.
- Repair the unserviceable scale.
- Maintain 0.25 mg/l free chlorine at all times at the outlet of the contact tank in order to maintain complete disinfection.
- Register all staff with DWS as Process Controllers.
- Maintain present mode of operation.

Overstrand Municipality revises on an annual basis the capacity and suitability of the WWTWs to meet the requirements of DWS for the quality of the final effluent being discharged to the receiving water bodies. When the water quality requirements for the final effluent becomes stricter and / or when the inflow to the WWTW has increased to such an extent that the capacity of the plant needs to be increased, the Municipality appoints reputed consulting engineering firms to undertake feasibility studies to perform technical and economical evaluation of the different options available for upgrading or extending the capacity of the treatment works.

The Sewer Master Plan (June 2016) has indicated that based on the most likely land-use development scenario, it will be necessary for the following Waste Water Treatment Works.

Table C.20: Future waste water treatment works required

Drainage System	Recommendations included in the Sewer Master Plan	Cost (R Million)
Baardskeerdersbos	New conservancy tank or package plant for the existing erven	0.730
Buffeljags Bay	New conservancy tank or package plant for the existing unserviced erven	0.730
Total		1.460

ASSET MANAGEMENT ASSESSMENT

An Asset Management Policy is in place. Overstrand Municipality however needs to differentiate between budget allocated towards the operation and maintenance of the water and sewerage infrastructure and the budget allocated towards the replacement of the water and sewerage infrastructure. A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of the existing water and sewerage infrastructure. In the case of operations and maintenance of the system, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the system remains in good condition.

It is important for Overstrand Municipality to develop an AMP from their Asset Register. The objective of an AMP is to support the achievement of the strategic goals of the Municipality and facilitate prudent technical and financial decision-making. It is also a vehicle for improved internal communication and to demonstrate to external stakeholders the Municipality's ability to effectively manage its existing infrastructure as well as the new infrastructure to be developed over the next 20 years.

This plan must be based on the principle of preventative maintenance in order to ensure that, as far as this is practical, damage to assets is prevented before it occurs. Overstrand Municipality needs to ensure that the maintenance and rehabilitation plan is part of the WSDP and that the plan is implemented. Assets must be rehabilitated and / or replaced before the end of their economic life and the necessary capital funds must be allocated for this purpose. Priority should be given to rehabilitating existing infrastructure as this generally makes best use of financial resources and can achieve an increase in (operational) services level coverage's most rapidly. The preparation of maintenance plans and the allocation of sufficient funding for maintenance are required to prevent the development of a large condition backlog. The potential renewal projects for water and sanitation infrastructure need to be identified from the Asset Register. All assets with a condition grading of "poor" and "very poor" need to be prioritised.

Business Element 6: Water Services Infrastructure Management (O&M)

Table C.21: Business Element 6: Operation and Maintenance (Topic 6)

Overview of Topic	Status Quo and Knowledge Interpretation Statistics				
This topic provides an overview of the sufficiency of resources and processes in place to effectively operate and maintain the water services. It reflects whether the municipality has an Operation and Maintenance Plan in place. The topic also illustrates whether the WSA has implemented good practice as directed in the Blue- and Green Drop certification processes	**Item**	**Quality (%)** assessment of current status against compliancy requirements	**Quantity (%)** an indication of the representation of the total area to address the issue	**Future Plan Assessment**	**Strategy Assessment**
	Operation & Maintenance Plan	60.00	60.00	60.00	60.00
	Resources	60.00	50.00	58.78	58.75
	Information	60.00	50.00	58.78	58.75
	Activity Control & Management	60.00	50.00	58.78	58.75
	Water Supply & Quality	90.79	80.00	60.00	60.00
	Waste Water Supply & Quality	89.14	80.00	60.00	60.00
	TOTAL for Topic	**69.99**	**61.67**	**59.39**	**59.38**

Problem Definition Statements

Nr	Statements - Short Comings	Possible Improvement / Project
1	All treatment works and operators need to be classified along the lines of the regulations by establishing a programme for certification of works, operators, technicians and managers. The process will include reviewing the skills needed and aligning resources to these needs as well as reviewing total staff numbers necessary to meet all the objectives in the National Water Act.	Veolia is responsible to ensure that the number of process controllers at each of the WTWs and WWTW and the class of process controller complies with the required number of process controllers and class of process controller per plant. Overstrand Municipality will monitor Veolia's compliance with regard hereto.
2	The Occupational Health and Safety Act contains provisions directing employers to maintain a safe workplace and to minimize the exposure of employees and the public to workplace hazards. It is therefore important for Veolia to compile a Legal Compliance Audit of the WTWs and WWTWs, which will provide them and the management of Overstrand Municipality with the necessary information to establish whether they are in compliance with the legislation or not.	Veolia is responsible for compliance with regard to the Occupational Health and Safety requirements at all the WTWs and WWTWs. Overstrand Municipality will monitor Veolia's compliance with regard hereto.
3	Shortcomings were identified as part of the Water Safety Plans and W_2RAPs.	Implement Improvement / Upgrade Plans of Water Safety Plans and W_2RAPs
4	Shortcomings were identified as part of the WTW and WWTW Process Audits.	Implement recommendations from detail WTW and WWTW Process Audits
5	It is important to note that all operational manuals of treatment unit processes such as chemical dosing, coagulation sedimentation, filtration, disinfection etc. should contain operational limits, monitoring programmes, verification procedures and pre-determined corrective actions. Corrective actions identified for each control measure need to be adhered to as soon as critical limits have been exceeded. The corrective actions are an important component of the management aspects of the Water Safety Plan and W2RAP and should be effective in restoring performance to acceptable levels when critical limits are exceeded.	Veolia needs to ensure that operational limits, monitoring programmes, verification procedures and pre-determined corrective actions are in place for all the WTW and WWTW treatment processes. Overstrand Municipality will monitor their compliance with regard hereto.
6	Ensure proper asset management, operation and maintenance of the existing bulk water and sewerage infrastrucuture and the training of staff involved in the operation and maintenance of the infrastructure.	Asset management, the operation and maintenance of the existing bulk water and sewerage infrastructure and the training of staff involved in the operation and maintenance of the infrastructure forms part of the Veolia Contract. Overstrand Municipality will monitor Veolia's compliance with regard hereto.

The Water Safety Plan and W_2RAP Teams of Overstrand Municipality are committed to meet regularly to review the implementation of all the aspects of the Water Safety Plan and W_2RAP to ensure that they are still accurate and to determine whether the field assessments need updates or modifications and whether the Incident Response Management Protocol is still adequate. In addition to the regular three year review, the Water Safety Plan and W_2RAP will also be reviewed when, for example, a new water source is developed, major treatment improvements are planned and brought into use, or after a major incident.

The Veolia Contract allows for the classification of all the treatment works and operators along the lines of the regulations by establishing a programme for certification of works, operators, technicians and managers. The process will include reviewing the skills needed and aligning resources to these needs as well as reviewing total staff numbers necessary to meet all the objectives in the National Water Act.

The Municipality needs to establish a mentoring role for operators ensuring an adequately trained and classified workforce with dedicated training programmes for supervisors and operators. Establish budgets to address the shortfall of skilled staff, rethink methods to retain qualified personnel and plan for succession and clear career paths for experienced staff. With such a program a source of specific resources of skilled operators, technicians and managers will be established.

The Occupational Health and Safety Act contain provisions directing employers to maintain a safe workplace and to minimize the exposure of employees and the public to workplace hazards. It is therefore important for Veolia Water Solutions & Technologies South Africa (Pty) Ltd to compile a Legal Compliance Audit of their WTWs and WWTW, which will provide the management of Veolia Water Solutions & Technologies South Africa (Pty) Ltd with the necessary information to establish whether they are in compliance with the legislation or not.

Overstrand Municipality and Veolia Water Solutions & Technologies South Africa (Pty) Ltd are committed to work with the DWS and the other role-players in order to further improve on the Municipality's 2014 Blue Drop Score for the various distribution systems. The Water Safety Plans, Process Audits that were carried out at all the WTWs and Operation and Maintenance Manuals which were compiled for all the WTWs will be used to improve the Municipality's performance. The Improvement / Upgrade Plan of the Water Safety Plan will also be implemented by the Municipality in order to address the potential risks identified through the Water Safety Plan process.

It is also important for Overstrand Municipality to continue with the upgrading of WWTWs when necessary, in order to reduce the risk of source contamination. WWTWs will be managed and operated by Veolia Water Solutions & Technologies South Africa (Pty) Ltd and Overstrand Municipality to comply with the permitted standards and in so doing intends to work towards green drop status for the Municipality's other WWTWs as well.

Veolia Water Solutions & Technologies South Africa (Pty) Ltd and Overstrand Municipality is committed to work with the DWS and the other role-players in order to improve on their 2013 Green Drop Score and to reduce the 2014 Wastewater Risk Ratings for the various WWTWs and to get the Municipality ready for the next round of assessments. The W_2RAPs that are in place for all the WWTWs will assist in reducing the current CRRs for the various WWTWs. The following will also further assist in the process of reducing the CRRs.

- Forward planning and upgrading / refurbishment of treatment plants to ensure adequate capacity for the flows received;
- Ensure sound management of the Water and Wastewater Treatment Operation Management Contract with Veolia Water Solutions & Technologies South Africa (Pty) Ltd;
- Monitoring of flow to- and from the plants;
- Sampling and monitoring of effluent quality;
- Appropriate authorisation in accordance with the National Water Act (36 of 1998); and / or
- Where plant is overloaded, introduce innovative methods to ensure enhancement of effluent quality.

Business Element 7: Associated Services

Table C.22: Business Element 7: Associated Services (Topic 7)					
Overview of Topic	**Status Quo and Knowledge Interpretation Statistics**				
This topic has been established to ensure adequate focus on the water services levels and needs of educational and health facilities. The water services planner will use this information to establish short-term solutions and to prioritize water services infrastructure projects to educational- and health facilities.	**Item**	**Quality (%)** assessment of current status against compliancy requirements	**Quantity (%)** an indication of the representation of the total area to address the issue	**Future Plan Assessment**	**Strategy Assessment**
	Water services – Education	76.00	56.00	56.00	56.00
	Water services - Hospitals	80.00	60.00	60.00	60.00
	Water services – Health Centers	80.00	60.00	60.00	60.00
	Water services - Clinics	80.00	60.00	60.00	60.00
	Sanitation - Education	76.00	56.00	56.00	56.00
	Sanitation - Hospitals	80.00	60.00	60.00	60.00
	Sanitation – Health Centers	80.00	60.00	60.00	60.00
	Sanitation - Clinics	80.00	60.00	60.00	60.00
	TOTAL for Topic	**79.00**	**59.00**	**59.00**	**59.00**

Problem Definition Statements		
Nr	**Statements - Short Comings**	**Possible Improvement / Project**
1	-	-

Education: All education facilities in Overstrand Municipality's Management Area are provided with adequate water services and no specific strategies, with regard to the provision of water services to these facilities, were therefore identified. Overstrand Municipality is however committed to work with the Education Department to address any possible shortcomings with regard to the provision of water services that might exist at any school or tertiary education facilities.

Health: Overstrand Municipality will strive to continue to ensure that the minimum required SANS241:2015 water quality standards are met through proper management, operation and maintenance of their WTWs and the systematic upgrading of their WTWs when required. The monitoring of provision of basic minimum services to farm dwellers remains a challenge, in view of the limited funding and human resources. The environmental health function is currently with the Overberg District Municipality. The Municipal Health Services of the Overberg District Municipality also report monthly to the Department of Environmental Health on water quality. The quality of life of the people within a Municipality is influenced by the available health care. Various things influence the health conditions of people in any region, for example access to clean water, good sanitation, proper nutrition and adequate housing.

It is important that a co-operative relationship be maintained between the Overberg District Municipality and Overstrand Municipality with regard to environmental health issues and that a good communication protocol is followed between the District Municipality and Overstrand Municipality to report on health issues.

The health profile in relation to treated water is good. Within the urban context, drinking water throughout the municipal area is considered to be of a high quality. The most vulnerable groups within Overstrand Municipality's Management Area are the persons living in informal areas with shared services. It is therefore of outmost importance that the communal standpipes are properly maintained, to promote better health and hygiene among users. It is necessary to:

- keep the standpipe area clean and free from stagnant water;
- avoid water spillage by keeping the tap closed when not in use;
- report and rectify leakages immediately;
- keep straying animals away from standpipe area; and
- keep the tap outlet, standpipe slab and soak away clean.

Overstrand Municipality further needs to promote health and hygiene awareness amongst standpipe users by focusing on the following:

- users must use the standpipe only for the filling of containers;
- no body or clothes washing is allowed at standpipes;
- no house pipes or other objects may be attached to the standpipes;
- use clean containers and close containers with a suitable lid when transporting water;
- disinfect containers when necessary; and
- immediately report any irregularities, contamination, tampering or vandalism at standpipes

The rehabilitation and maintenance of the basic services in informal areas have also had positive results, in that the installations appear neater, a healthier environment has been created and less pollution than previously takes place. It is believed that this played a significant role in reducing disease previously caused by unhygienic conditions and absence of basic services.

The supply of basic sanitation services on the farms needs to be linked to the provision of health and hygiene education. Improved health requires behaviour change, which also cannot be achieved with a single health education talk given by an outside expert. Behaviour change requires sustained monitoring and promotion within the community. This is the key-function of the community health workers employed on sanitation projects.

Overstrand Municipality needs to continue to actively engage with service providers and NGO's in the fight against illnesses such as HIV/Aids and TB. A solution to the sustainability of the community health worker's position and employment within the community has been to link their position and function to the activities of the Department of Health. In addition support can be provided to the Community Health Workers through local clinics and through the programmes of the EHPs. Education on the HIV/Aids pandemic would play a key role in stemming the spread of the disease.

Overstrand Municipality will therefore endeavour to improve their efforts to foster partnership-driven development in planning and implementation where partnerships include community members, CBOs, NGOs, the private sector and other spheres of government. In this regard the Department of Health is considered a particularly important partner whose collaboration is much needed.

Business Element 8: Conservation and Demand Management

Table C.23: Business Element 8: Conservation and Demand Management (Topic 8.1)					
Overview of Topic	**Status Quo and Knowledge Interpretation Statistics**				
The topic provides an overview of the activities pursued by the WSA in the past financial year towards water conservation and demand management. It also contains an overview of the water sources of the WSA.	**Item**	**Quality (%)** assessment of current status against compliancy requirements	**Quantity (%)** an indication of the representation of the total area to address the issue	**Future Plan Assessment**	**Strategy Assessment**
	Reducing unaccounted water and water inefficiencies	72.00	64.00	60.00	60.00
	Reducing high pressures for residential consumers	65.00	65.00	80.00	80.00
	Leak and meter repair programmes	66.67	66.67	66.67	66.67
	Consumer/end-use demand management	60.00	60.00	60.00	60.00
	TOTAL for Topic	**65.92**	**63.92**	**66.67**	**66.67**

Problem Definition Statements		
Nr	**Statements - Short Comings**	**Possible Improvement / Project**
1	Further reduce the percentage of Non-Revenue Water and Water Losses.	Continue with the implementation of the WDM Strategy and Action Plan to reduce the non-revenue water for the various distribution systems to 17% by June 2017 (SDBIP).
2	Repair leaks at all the indigent households	Continue with the repairing of leaks at all the indigent households.
3	Old meters and meters that are not accurate should be replaced.	Continue with the phased pro-active replacement of the old water meters, as identified through the detail water meter audit.
4	Implement an extensive schools WDM programme, which might also include annual competitions between schools (say with a prize for the lowest consumption, the lowest per capita consumption and for the best WDM-strategy poster design, etc.) Schools should be encouraged to make WDM programmes part of a long term project, where learners should be actively involved. A schools WDM programme should receive a high priority.	Support schools with WDM initiatives (Especially during Water Week)
5	Overstrand Municipality needs to continue to focus on the installation of water saving devices (specific water efficient toilets). The Municipality also needs to focus on raising awareness regarding conservation projects and the installation of water efficient devices in order to reduce the water demand and their percentage of non-revenue water.	Raise awareness under the public of water efficient devices and water conservation projects.

Table C.24: Business Element 8: Conservation and Demand Management - Water Balance (Topic 8.2 & 8.3)					
Overview of Topic	**Status Quo and Knowledge Interpretation Statistics**				
The topic provides an overview of the activities pursued by the WSA in the past financial year towards water conservation and demand management. It also contains an overview of the water sources of the WSA.	**Item**	**Quality (%)** assessment of current status against compliancy requirements	**Quantity (%)** an indication of the representation of the total area to address the issue	**Future Plan Assessment**	**Strategy Assessment**
	Surface water purchased	80.00	80.00	80.00	80.00
	Surface water abstraction	80.00	80.00	80.00	80.00
	Ground water abstraction	80.00	80.00	80.00	80.00
	Raw water supplied	80.00	80.00	80.00	80.00
	Total Influent	80.00	80.00	80.00	80.00
	Total treated TW	80.00	80.00	80.00	80.00
	Potable water to other Neighbours	80.00	80.00	80.00	80.00
	Purchased Treated water	80.00	80.00	80.00	80.00
	Ground water not treated	80.00	80.00	80.00	80.00
	Authorised consumption	75.00	75.00	75.00	75.00
	Total losses	60.00	60.00	60.00	60.00
	Billed unmetered	80.00	80.00	80.00	80.00
	Apparent losses	60.00	60.00	60.00	60.00
	Waste water treatment works	60.00	60.00	60.00	60.00
	Recycled	60.00	60.00	60.00	60.00
	TOTAL for Topic	**74.33**	**74.33**	**74.33**	**74.33**

Problem Definition Statements		
Nr	**Statements - Short Comings**	**Possible Improvement / Project**
1	-	-

Overstrand Municipality's WDM Strategy and Action Plan was previously listed under Section A: Conservation and Demand Management of this Report. Overstrand Municipality is committed to continue with the active implementation of their WDM Strategy and Action Plan in order to reduce the NRW within the various distribution systems as follows:

Table C.25: Committed reduction in total NRW (Include bulk distribution, treatment and internal distribution)			
Distribution System	**15/16 (%/a)**	**2020 (%/a)**	**2040 (%/a)**
Buffels River	50.0%	40.0%	30.0%
Kleinmond	32.9%	25.0%	15.0%
Greater Hermanus	22.6%	15.0%	15.0%
Stanford	40.7%	25.0%	15.0%
Greater Gansbaai	36.1%	25.0%	20.0%
Pearly Beach	28.1%	20.0%	15.0%
Baardskeerdersbos	56.5%	30.0%	15.0%
Buffeljags Bay	15.8%	15.0%	15.0%

PRVs were installed previously in Kleinmond, Stanford and Bettys Bay and no further PRVs were installed during the 2015/2016 financial year. A phased approach was followed for the investigation / implementation of pressure management in selected areas in the Overstrand Municipality's Management Area. The phases were as follows:

- Investigation and Logging (Desktop Study, Logging of pressures and flows, Analysis of data)
- Implementation (Design PRV Chambers, Pressure Management Implementation of new PRVs, Supply and installation of smart electronic pressure controllers for existing PRVs)
- Impact Assessment (Post pressure management logging to determine impact of new PRVs and / or installation of smart pressure controllers on existing PRVs)

Overstrand Municipality will continue with the repairing of leaks at all the indigent households. The following steps can be implemented by Overstrand Municipality to ensure that the project is sustainable.

- Identify areas with high minimum night flows. Record these flows before the project starts in order to ensure that the overall savings achieved by the project can be calculated.
- Visit properties occupied by indigent households on a priority basis (highest consumption first).
- Educate the customer about the project and water saving measures that can be implemented.
- Audit properties for any plumbing leaks and repair the leaks that are found.
- Meters found to be faulty must be replaced.
- Identify where there may be inefficient water usage and water wastage.
- Identify the number of people living at the property so as to determine a reasonable water usage.

Mechanisms to ensure that customers repair new water leaks, maintain an affordable consumption and does not build up arrears need to be addressed in the early stages of the project, in order to ensure the sustainability of the project.

Overstrand Municipality continues with the implementation of their pipeline replacement programme for all the priority areas with old reticulation networks and frequent pipe failures. It is important for Overstrand Municipality to also continue with the implementation of their Leakage Management Programme (Measure the volume of water that is lost, identify and qualify losses, conduct operational and network audits, improve performance: network upgrade, design action plans and sustain performance with good staffing / organization structures).

The Municipality is busy with the phased pro-active replacement of the old water meters, as identified through the detail water meter audit. The meters not working and the meters with existing leaks were also replaced and the leaks were repaired. The building inspectors include the inspection of the water meter installations during the foundation inspections at construction / building sites. This information is also implemented and captured on EMIS by the Building Inspectorate.

A rough estimate of the number of meters that need to be replaced every year is the number of meters divided by 12, assuming that the life of the meters is not more than 12 years. Although it is assumed that the average lifespan of a meter is 12 years for budgeting purposes, it is necessary to carry out research to determine the most optimal replacement of age for each type of meter in various circumstances. The research should identify the different types of meters, in different pressure zones and carry out accuracy tests for a number of samples at different ages. In this way a policy can be developed of when each type of meter under various circumstances should be replaced.

Overstrand Municipality needs to ensure that adequate funding is allocated under their Capital and Operational budgets towards the implementation of the WC/WDM initiatives. All external funding that could be utilised by Overstrand Municipality for this purpose should be sourced.

Overstrand Municipality's current water information database appears adequate from a water services management perspective (Metering of volume of water at source, WTWs, reservoirs and distribution zones). Overstrand Municipality is committed to continue with the metering of all the influent received at their WWTWs, the quantity of treated effluent re-used and the quantity of treated effluent returned to the Water Resource System. This information is critical for planning purposes with regard to WWTWs upgrading.

Overstrand Municipality is also committed to keep on updating the water balance models on a monthly basis in order to determine locations of wastage and to enable Overstrand Municipality to actively implement their WDM Strategy to reduce the percentage of NRW and water losses even further. The water balance will not directly lead to the reduction of the demand, but is an imperative management tool that will inform the implementation of demand- side management initiatives.

Business Element 9: Water Resources

Table C.26: Business Element 9: Water Resources (Topic 9)					
Overview of Topic	**Status Quo and Knowledge Interpretation Statistics**				
The volumes and sources of raw water supply to the WSA are presented in this topic, which also presents the status of the WSA's abstraction licenses and future needs. An overview of the WSA's monitoring programme for its raw water sources is presented. The topic also outlines the degree of industrial and 'raw' water use and effluent discharge within the WSA.	**Item**	**Quality (%)** assessment of current status against compliancy requirements	**Quantity (%)** an indication of the representation of the total area to address the issue	**Future Plan Assessment**	**Strategy Assessment**
	Sources and Volumes	75.00	75.00	-	-
	Monitoring	72.00	72.00	72.00	72.00
	Water Quality	70.00	70.00	70.00	70.00
	Wet Industries	60.00	20.00	40.00	40.00
	Raw Water consumers	80.00	80.00	80.00	80.00
	Industrial Consumer Units	40.00	20.00	40.00	40.00
	Permitted effluent releases	40.00	20.00	40.00	40.00
	TOTAL for Topic	**62.43**	**51.00**	**57.00**	**57.00**

Problem Definition Statements		
Nr	**Statements - Short Comings**	**Possible Improvement / Project**
1	Registration of water use with the DWS.	Ensure all bulk water abstraction from the various sources is registered with the DWS and legalised.
2	The safe yield of the existing resources supplying the Greater Hermanus with water will be exceeded in the nearby future.	Continue with the further augmentation of the Greater Hermanus water resources.
3	The industrial consumers in Overstrand Municipality's Management Area are not yet monitored, with regard to the quality and volume of effluent discharged by them.	Ensure that all industries apply for the discharge of industrial effluent into the sewer system, to monitor the quality and volume of industrial effluent discharged and to implement the set of by-laws with regard to the discharge of industrial effluent into Overstrand Municipality's sewer system in order to determine whether the quality comply with the standards and criteria.

Metering of all water consumption is one of the most significant steps in order to properly plan and manage water sources. Without metering no management is possible. Overstrand Municipality needs to continue with the monthly reading of all the existing bulk water meters.

The uncertainty in projected water-related climate change impacts is one of the biggest challenges facing water managers. The managers must understand how this uncertainty influences the management decisions to be made and that decisions must be appropriate to a possible range of scenarios. A critical tool in this regard is adaptive management, in which water resource systems are carefully monitored and management actions are tailored and revised in relation to the measured changes on the ground. One cannot predict climate change impacts with any certainty, and the recognition of this uncertainty must be built into all climate change response strategies.

Detail future water requirement projection models were developed for each of the distribution systems in Overstrand Municipality's Management Area. These models include the future projections up to 2040 and were calibrated by using historic billed metered consumption data and bulk metered abstraction data. The percentage NRW was determined for each of the distribution systems and growth in demand was based on agreed population and growth figures.

The projected future water requirements and the yield surplus or shortfalls are indicated in the table below for each of the systems.

Table C.27: Projected future water requirements and yield / licence surplus (+) / shortfall (-) based on WSDP model

Distribution System	Model	PROJECTED FUTURE WATER REQUIREMENTS (Ml/a)				
		2020	2025	2030	2035	2040
Buffels River	3% Annual Growth	884.142	1 024.963	1 188.213	1 377.465	1 596.860
	5% Annual Growth	973.380	1 242.307	1 585.534	2 023.588	2 582.668
	WSDP Model	**769.411**	**894.112**	**1 044.739**	**1 227.138**	**1 448.553**
	Yield surplus (+) / shortfall (-)	**+947.589**	**+822.888**	**+672.261**	**+489.862**	**+268.447**
Kleinmond	3% Annual Growth	895.215	1 037.799	1 203.094	1 394.715	1 616.857
	5% Annual Growth	985.570	1 257.865	1 605.390	2 048.930	2 615.011
	WSDP Model	786.692	869.204	963.919	1 072.861	1 198.442
	Yield surplus (+) / shortfall (-)	**+1 802.678**	**+1 720.166**	**+1 625.451**	**+1 516.509**	**+1 390.928**
Greater Hermanus	4% Annual Growth	5 640.602	6 862.655	8 349.469	10 158.406	12 359.254
	6% Annual Growth	**6 204.233**	**8 302.664**	**11 110.837**	**14 868.806**	**19 897.817**
	WSDP Model	**5 176.882**	**6 381.414**	**7 905.069**	**9 838.554**	**12 299.266**
	Licence surplus (+) / shortfall (-)	**+23.118**	**-1 181.414**	**-2 705.069**	**-4 638.554**	**-7 099.266**
Stanford	3% Annual Growth	449.540	521.140	604.144	700.368	811.919
	5% Annual Growth	494.913	631.648	806.161	1 028.888	1 313.151
	WSDP Model	**378.034**	**448.803**	**534.408**	**638.068**	**763.720**
	Licence surplus (+) / shortfall (-)	**+1 221.966**	**+1 151.197**	**+1 065.592**	**+961.932**	**+836.280**
Greater Gansbaai	4% Annual Growth	1 838.436	2 236.738	2 721.334	3 310.919	4 028.239
	6% Annual Growth	2 022.139	2 706.078	3 621.343	4 846.174	6 485.274
	WSDP Model	**1 598.890**	**1 958.054**	**2 407.057**	**2 969.706**	**3 676.325**
	Yield surplus (+) / shortfall (-)	**+1 169.091**	**+809.927**	**+360.924**	**-201.725**	**-908.344**
Pearly Beach	3% Annual Growth	174.956	202.823	235.127	272.577	315.991
	5% Annual Growth	192.615	245.831	313.750	400.433	511.065
	WSDP Model	**172.158**	**214.490**	**268.597**	**337.976**	**427.202**
	Yield surplus (+) / shortfall (-)	**+134.742**	**+92.410**	**+38.303**	**-31.076**	**-120.302**
Baardskeer-dersbos	2% Annual Growth	20.293	22.405	24.737	27.312	30.154
	4% Annual Growth	22.362	27.207	33.101	40.273	48.998
	WSDP Model	**11.890**	**11.538**	**11.227**	**10.951**	**10.706**
	Yield surplus (+) / shortfall (-)	**+78.110**	**+78.462**	**+78.773**	**+79.049**	**+79.294**
Buffeljags Bay	2% Annual Growth	5.992	6.615	7.304	8.064	8.904
	4% Annual Growth	6.603	8.033	9.774	11.891	14.467
	WSDP Model	**5.513**	**5.654**	**5.799**	**5.949**	**6.103**
	Yield surplus (+) / shortfall (-)	**+22.869**	**+22.729**	**+22.583**	**+22.434**	**+22.279**

The table below gives an overview of the years in which the annual water requirements is likely to exceed the sustainable yields from the various resources.

Table C.28: Years in which the annual water requirement will exceed the sustainable yields from the various resources

Distribution System	Total sustainable Yield (x 10^6 m^3/a)	Annual Growth on 2015/2016 requirement (2%, 3% or 4%)	Annual Growth on 2015/2016 requirement (4%, 5% or 6%)	WSDP Projection Model
Buffels River	1.717	> 2040 (3%)	2031 (5%)	> 2040
Kleinmond	2.589	> 2040 (3%)	2039 (5%)	> 2040
Greater Hermanus	5.200*	2018 (4%)	2017 (6%)	2020
Stanford	1.600	> 2040 (3%)	> 2040 (5%)	> 2040
Greater Gansbaai	2.768	2030 (4%)	2025 (6%)	2033
Pearly Beach	0.307	2038 (3%)	2029 (5%)	2032
Baardskeerdersbos	0.090	> 2040 (2%)	> 2040 (4%)	> 2040
Buffeljags Bay	0.028	> 2040 (2%)	> 2040 (4%)	> 2040

Note * With Gateway, Camphill and Volmoed Well Fields fully operational according to the licensed volumes.

Overstrand Municipality continues with their groundwater monitoring programmes for Hermanus (Hemel & Aarde), Stanford, Buffeljags Bay and Baardskeerdersbos. The DWS also updated their 2010/2011 All Towns Reconciliation Strategies during 2015 and the table below gives an overview of the recommended potential future water resources as included in the updated Strategies (**Comments by Mun.**):

Table C29: Potential future water resources for the various towns (DWS's All Towns Reconciliation Strategies)

Distribution System	Option	Potential
Betty's Bay, Rooi Els and Pringle Bay	Re-use of water	• The Buffels River area does not have its own WWTW and therefore the re-use water is not a feasible option for the area.
	Groundwater	• Boreholes into the Peninsula Formation north of the Buffels River Dam are likely to yield between 5 – 10 l/s (provided the right structures are targeted), with good water quality (Class 0-1) being present. It is recommended that only 0.5 – 1 M m³/a is abstracted from the Peninsula Formation, in order to prevent any large drawdowns in the environmentally sensitive recharge and discharge areas. Any groundwater use in this area should in turn be carefully managed and monitored. 0.5 – 1 M m³/a will only meet the low-growth scenario shortfalls up to 2035, and other water sources will be required to meet the medium and high-growth scenario future shortfalls.
	Surface Water	• The Buffels River Dam is currently supplying the towns of Betty's Bay, Rooi Els and Pringle Bay. It has a maximum safe yield of 1.617 million m³/a, which is sufficient for the current population as the current water requirement is only 0.925 million m³/a for the low-growth scenario and 0.943 million m³/a for the high-growth scenario. • Betty's Bay is close to the lower Palmiet River making the river an obvious choice to supply the town when the water requirement exceeds the capacity of the current resources after 2040. The Rooi Els River is also another river considered for investigation if the Palmiet River may not be a good choice.
	Other Sources	• Rainwater harvesting is a suitable option for the area, considering the MAP is acceptable for rainwater harvesting to be deemed feasible. This should be promoted for all new houses being built.
	Summary	**The current water sources have adequate supply to cater for the medium and longer term future water requirements. The following sources are identified as potential sources to augment the water supply (In order of priority and implementation sequence):** • Continue with the implementation of the WC/WDM Strategy and measures. • Groundwater development in the TMG Aquifer. • Raising of Buffels River dam wall • Abstraction from the Palmiet River • Abstraction from the Rooi Els River
Kleinmond	Re-use of water	• Re-use of water from the WWTW for domestic purposes can only be allowed if the existing works is upgraded to a suitable process technology that can provide a 95% assurance of supply in terms of quality requirements.
	Groundwater	• Future groundwater targets should include the confined Peninsula Formation to the NE of the golf course along a NE-SW orientated normal fault, where high yields and good quality water (Class 0-1) can be expected. The unconfined Skurweberg Formation can also be targeted in the area, although the yields are likely to be lower and higher iron concentrations might be present.
	Surface Water	A study was carried out on the Palmiet River by DWS for further development of the surface water resources with the following recommendations: • Transferring water from the Kogelberg Dam to the Steenbras Dams and this was implemented the same year and provided 22.5 Mm³/a at 1:50 year assurance. • Raising of the current Eikenhof Dam to increase its capacity from 22.5 Mm³/a to 30 Mm³/a and this would provide additional yields of 4.5 Mm³/a for the Palmiet River area. The total storage would be only 27% of the MAR of 301.8 Mm³, but the ecological freshwater flow requirements of the Palmiet River would limit further development. **The Municipality is currently in discussions with Overberg Water to investigate the possibility of a regional scheme with Overberg Water for the bulk supply from the Theewaterskloof Dam to Kleinmond.**
	Other Sources	• Rainwater harvesting can be a suitable option for the area, considering the mean annual precipitation is acceptable for rainwater harvesting.
	Summary	**The current water sources have adequate supply to cater for the medium and longer term future water requirements. The following sources are identified as potential sources to augment the water supply in the future if required (In order of priority and implementation sequence):**