Environmental Impact Assessment (EIA) for the Proposed Construction, Operation and Decommissioning of a Sea Water Reverse Osmosis Plant and Associated Infrastructure Proposed at Lovu on the KwaZulu-Natal South Coast

FINAL EIA REPORT

CHAPTER 13: CONCLUSIONS AND RECOMMENDATIONS

CONTENTS

13. CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the key findings and recommendations from the EIA process based on the specialist studies and the EAP's opinion on the environmental suitability of the project and whether the project should receive environmental authorisation.

The conclusions on the most significant impacts identified, together with the management actions required to avoid or mitigate the negative impacts (or to enhance the positive benefits) are presented in the following sections. Other possible impacts arising from the proposed project, including waste, stormwater management and heritage that were identified during the Scoping Phase but that did not justify the need for a specialist study, have been addressed through suitable management measures also included in the Draft EMPr (Section B).

13.1. KEY FINDINGS ASSOCIATED WITH THE PROPOSED DESALINATION PLANT

For the potential significant impacts of this project, specialist studies were conducted and included in Chapters 6 to 12 of the EIA Report:

Specialist	Organisation	Specialist study	EIA Report
Dr. Andrea Pulfrich	Pisces Environmental Services	Marine Ecology Assessment	Chapter 6
Steven Weerts and Shamilla Pillay	CSIR	Estuarine Ecology Assessment	Chapter 7
Dr. Liz Day	The Freshwater Consulting Group	Freshwater Ecology Assessment	Chapter 8
Simon Bundy	Sustainable Project Developments cc	Terrestrial Ecology Assessment	Chapter 9
Henry Holland	MapThis Trust	Visual Impact Assessment	Chapter 10
Brett Williams	Safetech	Noise Impact Assessment	Chapter 11
Dr. Hugo van Zyl	Independent Economic Researchers	Socio-economic Assessment	Chapter 12
Len van Schalkwyk	eThembeni Cultural Heritage	Heritage Assessment: Letter for Exemption	Appendix E

13.1.1. Marine ecology

Based on the marine ecology specialist study, the marine environment will be impacted to some degree during both the construction and operational phases of the proposed SWRO Desalination Plant at Lovu. The following main negative impacts during the construction phase have been identified:

- Disturbance and destruction of subtidal sandy and rocky reef biota during laying of the intake and discharge pipelines, jetty construction, surf-zone excavation and rock blasting.
- Effects of blasting on macrophytes, invertebrates and fish communities.
- Disturbance and destruction of intertidal beach macrofauna during pipeline construction as a result of vehicular traffic and excavations.
- Accidental spillage or leakage of fuel, chemicals, or lubricants that may cause water or sediment contamination and/or disturbance to beach and subtidal biota.
- Effects of blasting on marine communities, particularly turtles and marine mammals

The residual significance of these impacts (i.e. with the effective implementation of recommended management measures) is predicted to be **low** to **medium**.

During the operational phase, the main negative impacts are associated with the potential presence of antiscalants (non-toxic at the concentrations used but may bind nutrients and ions needed for plant growth) and heavy metals (originating from corrosion processes) in the brine discharged at sea as well as the permanent loss of habitat under submerged intake and discharge pipelines. The later impact however will be compensated by the fact that the submerged structures would offer a new settling substrate for hard bottom species and would therefore act as artificial reefs (**positive impact**). Recommended management actions will reduce the negative impacts of high and medium significance to **low** significance.

13.1.2. Estuarine ecology

The Lovu Estuary is an important functional estuary that contributes significantly to the estuarine resources in this section of the coastline. As estuarine resources are under threat, nationally and internationally through development pressure, these environments are identified as conservation worthy and any further impacts on these systems must be critically assessed.

The key impacts identified in the Estuarine Ecological Impact Assessment study are associated with the construction phase of the proposed project and relate to:

- Decrease of the ecological corridor and associated impacts, between the channel and the *Preferred* site location.
- Potential for increased estuarine turbidity with consequent impacts on aquatic fauna during excavation activities along the *Alternative 2 pipeline route*.
- Loss of indigenous vegetation at the exit pit of the tunnelled section of the *Alternative 2 pipeline*.
- Potential disturbance of fauna due to noise and vibrations, and removal of vegetation during construction of *the Alternative 2 pipeline route*.

The residual significance of these impacts is predicted to be **low**, with the exception of the potential disturbance of fauna due to noise and vibrations which remains of **medium** intensity. Note however that the assessment of this impact has been done with a low degree of confidence.

The construction of the proposed desalination plant at the *Preferred site* or at the *Alternative site* is anticipated to result in estuarine impacts of similar significance, providing that the recommended management actions are effectively implemented, in particular a setback distance of 25 m for the Preferred site to increase the ecological corridor between the development and the channel. Note that the Alternative site has slightly lower risk of being impacted by major floods.

While there is no strong indication for selection of any of the various pipeline routes in terms of estuarine impacts, there is some uncertainty regarding potential impacts on groundwater (although anticipated to be unlikely) and impacts of vibrations and noise from tunnelling especially for Alternative 2 which crosses a sensitive area of estuary. This study therefore recommends the selection of the options that involve north bank routing (*Preferred route or Alternatives 1 or 3 pipeline routes*).

13.1.3. Aquatic ecology

A number of freshwater ecosystems, all classified as watercourses, were identified as potentially affected by the proposed project. These include two degraded valley bottom wetlands that contribute to the formation of an extensive wetland area which has, however, been almost wholly subsumed by sugar cane cultivation. On the northern floodplain, small patches of more naturally vegetated wetland habitat occur. Despite their level of degradation, these wetlands are considered rehabilitable to a more natural condition. Two minor channelized watercourses, one of them considered wholly artificial, were also identified along the proposed powerline and the northern seawater intake and brine discharge pipeline route alternatives.

Most impacts to freshwater ecosystems would be associated with disturbance during the construction of the northern pipeline route alternatives (*Preferred route and Alternatives 1 and 3*), generally entailing damage resulting from vehicle compaction, dewatering, sediment accumulation, removal of wetland vegetation and disruption of ecological connectivity, in particular when affecting the more natural wetlands on the northern floodplain (artificial trenched wetlands and cane field wetlands). Recommended mitigation is likely to be effective and the residual impacts are anticipated to be of **low** significance.

Although disturbance to the other watercourses would also be likely, as part of the construction activities, this was generally considered of **low** significance only and mitigatable to even lower levels through standard best practice construction measures.

The developer's *Preferred site* location, lying in close proximity to the estuarine channel, although above the 1:100 year floodline is anticipated to have readily mitigatable **low** significance impacts to the adjacent freshwater ecosystems, comprising the already highly degraded cultivated wetlands on the southern floodplain. By contrast, the *Alternative site* would lie in close proximity to the two valley bottom wetlands feeding into the cultivated wetlands, and would be likely to impact substantially on these systems, which would be considered sensitive to erosion and plant clearing. These impacts (construction phase) could be mitigated to a **medium** significance rating, by setting the proposed Alternative site back from the channel by at least 25m, and implementing rehabilitation measures prior to construction, to improve channel resilience to impacts.

The main impacts on freshwater ecosystems during the operational phase are the potential degradation (erosion from concentrated flows) of the two valley bottom wetlands and associated cultivated wetlands along the southern bank of the estuary due to increased stormwater runoff from hardened surfaces at the desalination plant. With the effective implementation of recommended mitigation measures, the significance of this residual impact is expected to be **low**.

The construction of the proposed desalination plant at the *Preferred site* will therefore result in less significant impacts on freshwater features. It must be noted that the wetland/aquatic systems assessed as part of this study and the estuarine system are in fact integrated, and should ideally be assessed as an integrated aquatic ecosystem. The overall biodiversity of the estuary and its associated floodplain wetlands would not be served by promoting significant negative impacts on the estuary to protect freshwater ecosystems. Therefore, in the event of selecting the Alternative site, additional mitigation is strongly recommended, in the form of offset rehabilitation of a broad swathe of the cultivated wetland, as far as its passage into the estuary channel at the downstream end of the floodplain.

13.1.4. Terrestrial ecology

The seashore and dune form in and around the proposed pump station at Lovu has been demonstrated to be highly dynamic and in recent times, has shown increased mobility. This state is brought about primarily on account of both climatic and anthropogenic incursions into the subject area, as well as possible off site disturbances.

The mesic environment, inland of the dune form is considered to be *highly transformed*, comprising of primarily existing cultivated lands, a railway servitude and an existing caravan park. These areas are generally considered to be *of low ecological* significance and depending upon the preferred land use, require management input in order to improve the natural ecological function and state of the areas in question. The proposed powerline routes, located along the identified corridors, traverse a number of riparian, wetland and secondary grassland areas.

The most significant impact is associated with the disturbance to the frontal dune during the construction of the intake and brine discharge pipelines. Trenching of these sections of the proposed pipelines through the dunes will also lead to long term secondary impacts (i.e. indirect impacts) such as increased mobility (or the potential to mobilise) within the dune system, which can only be addressed through a sea defence and/or further stabilisation. The latter may in turn alter sediment and beach dynamics.

Therefore, given the complex nature and dynamics of the frontal dune system as well as the number of interelated processes associated with this environment, the proposed trenching of the marine pipelines through the dune cordons, although not a fatal flaw, would lead to a number of **significant** direct and indirect impacts on the dune system and surroundings, during the construction and operational phase. These impacts are also mostly considered to be of very low reversibility, with some anticipated to be irreversible. It is therefore **strongly recommended** to **pipe jack** the proposed seawater intake and brine discharge pipelines under the dunes, with specific consideration towards maintaining a narrow working corridor. A terrestrial ecologist

should be involved in the engineering design to confirm the entry and exit location of the pipeline under the dunes. This change in the design of the proposed project would be expected to lead to much more acceptable impacts (**low** significance) on the dune system and associated surroundings.

Following the effective implementation of the recommended key mitigation actions, all impacts on terrestrial ecology, associated with the proposed project are predicted to be of **medium to low** significance, with the exception of impacts associated with the disturbance of the general surface environment and resulting alterations in hydrological aspects (surface flow etc.) at the proposed Alternative site which are anticipated to be of **high** significance. The most significant impacts associated with the proposed powerline are the potential to impact upon avian behavior and in some cases, avian populations. Habitat associated with bird corridors (valleys, wetlands and riverine environments) that are traversed by powerlines should have mitigation measures to reduce bird strikes and electrocution established on the conductors.

Based on the above, the terrestrial ecology study recommends the *Preferred site* for the sitting of the proposed desalination plant, while it did not provide a preference for a specific pipeline route given that most of the pipeline route (for either alternative) traverses the wetland/estuarine environment and is therefore assessed as part of that study.

These impacts can to a certain extent be mitigated but, as in the case of the dune and beach environment, the mitigation measures may elicit other "knock on effects" while also exacerbating other problems. Monitoring and management of the coastline is thus an important management aspect of the construction and operation of the proposed desalination plant.

13.1.5. Noise Impacts

Results of the Noise impact study showed that, during the construction phase, there may be some short term increase in noise in the immediate areas surrounding either option for the desalination plant site and pipeline route alternatives as well as areas in the vicinity of the proposed powerline route as the ambient noise levels may be exceeded in some areas. It must be noted that noise associated with blasting and drilling during the construction phase will be difficult to mitigate.

Residents are not anticipated to be significantly impacted by noise generated at either the main plant or at the pump station during the operational phase. Long term noise impact from the plant during the operation phase will be concentrated in the immediate area around the facility. For the *Preferred site*, predicted noise emissions from the main plant (36.5 dB(A)) will not exceed daytime noise rating limits but might exceed the rural night limit of 35 dB(A) at the northern most portion of the school. Although it is difficult to quantify the exact impact due to the shielding effect the current buildings have on noise emissions, it is not anticipated that the noise impact will exceed the limits indoors. The noise emissions from the main plant at the Alternative site will not exceed the rural daytime and night limits at any sensitive receptor, providing that the private housing located on the northern portion of the Alternative site (NSA10 – Illovo's property) is removed.

Residual noise impacts associated with the proposed plant are predicted to be of **low** and **very low** significance during the construction and operational phases respectively, provided the recommendations for mitigating noise impacts are applied effectively. These include construction and operational management techniques to minimise impact as well as physical design considerations.

Based on the above, noise impacts will be similar for the Preferred and the Alternative site for the desalination plant and for all pipeline routes.

13.1.6. Visual Impacts

The landscape proposed for the desalination plant sites is predominantly rural-agricultural but it is in close proximity to, and surrounded by, an urban landscape with a mixture of landscape character types. The desalination plant will introduce a more industrial development type into a landscape that is mostly agricultural in character.

A number of highly sensitive visual receptors who may potentially be affected by the proposed desalination project have been identified. These include Residents of Mother of Peace Illovo orphanage, Residents and viewpoints on farms in the surrounding landscape, Residents of Illovu Village, Residents of Winklespruit, Residents of the Boardwalk residential complex and Residents of Illovo Beach.

Key visual impacts have been identified to be associated with the construction phase, in particular the construction of the desalination plant at either site and the marine pipelines (including construction of the temporary jetty) during which the residual visual impacts on sensitive visual receptors are predicted to be of **high** significance.

Residents of the orphanage will be most affected by construction activities associated with the desalination plant and the changes to their existing views. The results of the visual study indicated that the viewshed of a desalination plant at the Preferred site is slightly smaller than that for the Alternative Site given that the latter is at a higher elevation than the Preferred Site. However, visual intrusion of construction activities at the Preferred site is likely be higher for the residents of the Mother of Peace orphanage than if the proposed plant is constructed at the alternative site since there is some buffer between the viewers and the site.

Similarly, high visual intrusion associated with the temporary jetty will occur on a number of highly sensitive visual receptors, including residents of the Boardwalk complex, residents of Winklespruit (west of the railway line as well as residents of large residential complexes just north of the site) and residents of Illovo Beach.

The construction of the northern alternatives for the pipeline route (*Preferred Route and Alternative 1 and 3*) may impact highly sensitive receptors, in particular the construction of the section of pipeline east of the N2 which will potentially affect some residents of Illovo Beach. Similarly, the construction of the pump station and the proposed powerline may affect highly sensitive receptors. The significance of these visual impacts, following the effective implementation of the recommended management actions, is anticipated to be **low** for all

components, except for the powerline from Kingsburgh Major Substation to the desalination plant for which potential residual visual impacts will be of **medium** significance.

During the operation of the proposed desalination plant, impact on the landscape is predicted to be of medium significance given the medium sensitivity of the landscape character to the proposed development. However, with the implementation of recommended management actions aiming at reducing the industrial aspect of the development, the residual impact on the landscape would be of **low** significance.

The proposed development is also anticipated to intrude on existing views of sensitive visual receptors in the surrounding landscape and to impact (night lighting) on the nightscape of the surrounding region, in particular the desalination plant (at either site) given the close proximity of highly sensitive visual receptors, i.e. Mother of Peace Illovo orphanage. With the effective implementation of recommended management actions, the significance of the visual intrusion of the proposed development is predicted to be **medium** for the desalination plant (at either site) and **low** for the powerline and the pump station. The residual impact of night lighting of the proposed desalination plant is anticipated to be of **low** significance.

With the effective implementation of mitigation measures, visual impacts associated with construction activities at the desalination plant should not prevent the project from being developed. The Preferred Site has more potential to mitigate while the Alternative Site has more risks due to the need to develop on relatively steep slopes. However, successful mitigation will reduce the intensity of the impact for both sites.

13.1.7. Socio economic Impacts

The socio-economic assessment found that the project would be associated with a number of **positive** socio-economic impacts. The proposed project should prove to be largely compatible with relevant water supply planning and with relevant economic development and associated spatial planning for the area provided environmental impacts can be kept to an acceptable minimum. Clear justifications for moving to the detailed feasibility assessment and associated EIA phase for desalination is expressed whilst recognizing risks associated with high costs It must be noted that given the limited alternatives, the avoidance of higher costs into the future is unlikely to be possible.

The proposed desalination plant is also predicted to have a **positive** impact of **medium** significance on economic activity given the size of the new spending injections associated with it.

The main key finding with regard to risks and negative impacts associated with the proposed project relates to the potential loss of sports field lands that would be associated with the construction of the proposed desalination plant at the *Preferred site*, visual and sense of place impacts (during construction and operation of the plant), and noise impacts (in particular during construction) on the Mother of Peace Children's Home. With the effective and particularly rigorous implementation of mitigation measures, residual impacts are predicted to be of a **medium** significance for the *Preferred site* and **low** significance for the *Alternative site*.

The construction phase would be associated with high intensity visual, noise and dust impacts along with disruptions. This would entail risks to the short-term saleability of surrounding property as would be the case with virtually all major construction projects, leading to a residual impact on property values of **medium** significance during the construction phase. The property market is, however, likely to take its lead from permanent impacts and not temporary disturbances. Longer term impacts with mitigation during the operational phase were found to have a **low** significance. However, it needs to be borne in mind that the project would augment water supplies which are critical if property values are to be maintained. In this sense, the project or any other water supply project would provide important support for property values.

During the construction phase, impacts associated with the influx of workers as well as impacts on commercial and recreational fishing, and on tourism and recreation, in particular at the beach and estuary area, are anticipated to be potentially significant. However, with the implementation of the recommended management actions, these residual impacts would be of **low** to **medium**.

With respect to **alternatives**, the *Alternative Site* for the plant would hold clear advantages over the *Preferred Site* in terms of lower opportunity costs associated with land conversion and lower impacts on the Mother of Peace Children's Home. The *Alternative Site* should, however, entail ~R23 million higher financial costs relative to the *Preferred Site* and would be arguably less compatible with spatial planning for the area as reflected in the Illovo South Local Area Plan. Both sites therefore have their socio-economic advantages and disadvantages which are conceptually difficult to reconcile particularly without further more detailed investigations and assessment. It is also worth noting that the ~R23 million 'savings' associated with the *Preferred Site* relative to the *Alternative Site* may present an opportunity to undertake particularly rigorous mitigation thereby resulting in more acceptable outcomes for the Mother of Peace Children's Home and Illovo Sugar.

For the pipeline alternatives, the Applicant's *Preferred Pipeline* would be most favourable from a cost perspective. It would, however, require the applicant to engage further with the owners of the Winkelspruit Caravan Park site with a view to finding an agreement to avoid impacts. It would also entail significant risks to dune stability as assessed in the terrestrial ecology report which may outweigh cost advantages.

Given the costs of the desalination plant it is likely that **water tariffs** in the area will have to continue increasing at rates above the base tariff and probably above the general rate of inflation. Bear in mind that any tariff increases related to desalination would take place within a context where it is likely that tariffs will need to increase regardless of which water supply option is implemented next.

13.1.8. Summary of the comparative assessment of the positive and negative implications of the proposed activity

Sections 13.1.1 to 13.1.7 provide a summary of the findings of the specialist studies (or inputs) that were sourced as part of this EIA process. Table 13.1 summarises the overall significance of these impacts following the implementation of the recommended mitigation and management measures.

From this table it can be seen that provided the stipulated management actions are implemented effectively, no negative impacts of high significance are predicted to occur as a result of this project, with the exception of residual **negative** impacts associated with disturbance of the general surface environment at the proposed Alternative site and visual impacts associated with construction activities with which remain of **high** significance. The **positive** impacts generated by the project are associated with the economic benefits from employment opportunities, knowledge gained from conservation of potential fossil finds and the fact that the proposed facility is largely compatible with relevant water supply planning and with relevant economic development and associated spatial planning for the area.

Considering that all the negative impact would be appropriately managed and the positive impacts enhanced through mitigation measures and management actions included in the draft EMPr (Part B of this Final EIA report), the potential negative residual impacts associated with the proposed project are not anticipated to be significant.

Based on the findings of the specialist's studies, the construction and operation of the proposed desalination facility at the *Preferred* site or at the *Alternative site* will largely result in environmental impacts of comparable significance, providing the recommended mitigation measures are effectively implemented. Disturbance of general surface environment and alteration of edaphics at depth associated with the construction of the Alternative site may however result in significant variation in soil nutrient levels, permeability and related factors (e.g. change in hydrology). Both sites have their socio-economic advantages and disadvantages which are conceptually difficult to reconcile particularly without more detailed investigations and assessment. If the Preferred Site is chosen an amicable solution will need to be found to the provision of replacement sports fields for the Mother of Peace Children's Home. These fields would need to be of a similar size and quality containing the same facilities as at present and should be established before the existing sports fields are built on. They will need to also be adjacent to the existing Mother of Peace buildings which implies that land would be needed from Illovo Sugar.

For the pipeline alternatives, the overall environmental impact significance rating is slightly lower for the three pipeline routes located on the northern bank of the Lovu estuary, provided that the Preferred pipeline route (and Alternative 3 route) is moved slightly south, to align it with the existing disturbed areas of the cane field. The Applicant's *Preferred Pipeline* would be most favourable from a cost perspective (with the Alternative 1 and 3 pipeline routes being more costly). It would, however, require the applicant to engage further with the owners of the Winkelspruit Caravan Park site with a view to finding an agreement to avoid impacts. Should this engagement not be successful, the Alternative 3 route, although a more expensive

tunnelling alternative, would be recommended for the most difficult section of the onshore pipeline route (which is fairly confined and passes under the railway, the M3 and the N2).

Although decommissioning must be considered as a possibility, the probability of the plant being decommissioned is near zero. The intention would be to manage the plant indefinitely and to upgrade components of the plant as and when required. Once commissioned the plant would form an integral part of the supply system for the South Coast and as such will be needed for future supply to the area. Seawater desalination technologies will improve with time and it is possible that components of the scheme may be replaced (mostly internal process components) as these technologies improve. However, it is extremely unlikely that the plant will be decommissioned in totality.

Table 13.1: Comparative assessment of overall impacts following mitigation measures

	Preferred site	Alternative site	Pipeline		Powerline
			Preferred /Alternative 1 & 3 routes	Alternative 2 route	
Construction					
Marine Ecology Assessment	-	-	Low (Low Positive)	Low (Low Positive)	-
Freshwater Ecology Assessment	Low	Low-Medium	Very Low	-	Very Low
Estuarine Ecology Assessment	Very Low - Low	Very Low - Low	Very Low – Low	Very Low - Medium	Very Low - Low
Terrestrial Ecology Assessment	Low-Medium	Low – High	Low	Low	Low-Medium
Noise Impact Assessment	Low	Low	Low	Low	Low
Visual Impact Assessment	High	High	Low	Low	Low-Medium
Socio-economic Assessment	Low-Medium (Medium Positive)	Low (Medium Positive)	Low-Medium	Low-Medium	Low-Medium
Heritage Assessment: Letter for Exemption	Low	Low	Low	Low	Low
Operation					
Marine Ecology Assessment	Low	Low	-	-	-
Freshwater Ecology Assessment	Low	Low	Very Low	-	-
Estuarine Ecology Assessment	Very Low - Low	Very Low - Low	-	-	-
Terrestrial Ecology Assessment	Low	Low	Low-Medium	Low-Medium	Low-Medium
Noise Impact Assessment	Very Low	Very Low	Very Low	Very Low	-
Visual Impact Assessment	Low-Medium	Low-Medium	-	-	Low
Socio-economic Assessment	Low-Medium (Medium Positive)	Low-Medium (Medium Positive)	-	-	Low-Medium
Heritage Assessment: Letter for Exemption	-	-	-	-	-

13.2. RECOMMENDED MANAGEMENT AND MONITORING REQUIREMENTS

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
MARINE ECOLOGY		
DESIGN PHASE ▪ Install screens to prevent fish from entering the system while still allowing adequate water flow. CONSTRUCTION ▪ Comply with Umgeni Water Construction Specification for Environmental Management	DESIGN PHASE ▪ Design plant properly, e.g. by eliminating dead spots and threaded connections, to reduce corrosion to a minimum (corrosion resistance is considered good when the corrosion rate is <0.1 mm/a (UNEP 2008). ▪ Lay pipeline in such a way that required rock blasting is kept to a minimum. ▪ Establish a rigorous Blasting Method Statement/Protocol in accordance with SANS standards, with adherence to all public safety requirements and which minimise the environmental effects of shock waves (e.g. no turtles, marine mammals or flocks of diving or swimming birds within a 2-km radius of the blasting point, smaller, quick succession blasts, one blast per day etc.) ▪ Conduct an entrainment study. ▪ Conduct a study on the chemical and physical properties of the raw water at the proposed intake site prior to the design and construction of the desalination plant. CONSTRUCTION ▪ Keep heavy vehicle traffic associated with pipeline or breakwater construction on the beach to a minimum and restrict vehicles to clearly demarcated areas. ▪ All construction activities in the coastal zone must be managed according to a strictly enforced Environmental Management Plan. ▪ Compile and implement a Protocol for refuelling/servicing activities under normal and emergency situations ▪ Compile and implement a Spill Contingency Plan or Response Method Statement	1. Undertake a grab sampling survey of benthic macrofauna in a pre-established grid around the discharge position (duration of the baseline study (18 mths to 2 years before the commencement of construction) will depend on the sampling programme design). 2. Once in operation, conduct a monitoring program to ensure that the diffuser is performing to the expected specifications and that required dilution levels are achieved. 3. Confirm brine and thermal footprints by sampling with a conductivity-temperature-depth (CTD) probe to confirm the performance of the discharge system and the numerical model predictions. 4. Undertake WET testing of the discharged effluent for a full range of operational scenarios (i.e. shock dosing, etc.) to ensure complete confidence in the potential effects of co-discharged constituents and the antiscalant to be used. 5. Continuously monitor the effluent for residual chlorine and dissolved oxygen levels. If dissolved oxygen levels are too low (due to overdosing of sodium bisulfite), aerate if necessary. 6. Periodically assess bacterial regrowth. 7. Biocide and co-pollutant concentrations in the discharge to not exceed the No Observed Effect

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	▪ Good house-keeping must form an integral part of any construction activities on the beach from start-up. ▪ Restrict disturbance of the sea bottom to the smallest area possible. ▪ Restrict vibration-generating activities to the absolute minimum required. ▪ All blasting activities should be conducted in accordance with Blasting protocol/Method statement. OPERATION ▪ Keep intake velocities below ~0.15 m/s to ensure that fish and other organisms can escape the intake current. ▪ If biocide dosing proves ineffective in controlling marine growth then undertake regular pigging of the intake pipelines. ▪ Undertake intermittent chlorination of the intake water to prevent bacterial regrowth in the brine. ▪ Ensure that residual chlorine is suitably neutralised with sodium bisulfite (SBS); residual chlorine in the brine discharge must be below No Observed Effect Concentration (NOEC) and/or the relevant water quality target values. ▪ Avoid the use of nutrient-enriching antiscalants, and use antiscalants with low toxicity to aquatic invertebrate and fish species.	Concentration and/or the relevant water quality target values (<3 µg/ℓ) 8. Regularly monitor the effluent for heavy metals until a profile of the discharge in terms of heavy metal concentrations is determined. 9. Check corrosion levels of plant constituent parts and the physical integrity of the intake and outlet pipes and diffuser and replace or modify components if excessive corrosion is identified or specific maintenance is required. 10. Implement a monitoring program to study the effects of the discharged brine on the receiving water body, which is associated with the validation of the model results, and use the information to develop a contingency plan that examines the risk of contamination, and considers procedures that must be implemented to mitigate any unanticipated impacts.
AQUATIC AND ESTUARINE ECOLOGY		
DESIGN PHASE ▪ The powerline support towers would not be located within drainage lines/wetlands, and would be spaced so as to allow the lines to span across low points (spanning distances from 300 – 400 m, but up to 600m if necessary). ▪ The 132kV transmission line towers	DESIGN PHASE ▪ Re-routing of the Preferred pipeline route further south, to run along the existing disturbed areas of the cane field. ▪ For the Alternative 2 pipeline route, the reception pit for tunnelling on the south bank should be moved by at least 100-130m further west. ▪ For the Preferred site, the development should be moved back to create an ecological corridor of at least a 25 metre extension between the development and the channel. ▪ Powerline to be turned towards the south just short of the riparian	1. Visually inspect water passing into channels for signs of turbidity – upstream and downstream assessment sites should be used. 2. Annual assessments of estuarine and wetland areas adjacent to the site to identify areas of erosion or sources of possible salt water contamination. 3. If construction operations unavoidably result in increased turbidity in the river or estuary,

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions

will span the whole 1:100 year floodplain, at the point where they would cross the Lovu Estuary (a distance of about 375m).
 	
CONSTRUCTION
▪ Comply with Umgeni Water Construction Specification for Environmental Management.
	area, within the cane field zone.
	▪ In the event of selecting the Alternative site,
	  ▪ setback the site by at least 25m from the edge of watercourses 3 and 3A
	  ▪ offset rehabilitation of a broad swathe of the cultivated wetland, as far as its passage into the estuary channel at the downstream end of the floodplain.
	▪ Design and implement a stormwater management plan to control the velocity, quantity and quality of runoff from the site (particular attention should be given to limit the amount of hardened surfaces, measures to include SUD principles)
	
	CONSTRUCTION
	▪ Demarcation of canefield wetland areas as no go areas and controls over construction camps etc.;
	▪ Limit construction footprint and undertake awareness training for all staff (flora and fauna);
	▪ Construction activities involving the movement of vehicles over wetland areas, dewatering, excavation or other forms of disturbance to the ground surface should be restricted to the dry season (winter) when the water table is low;
	▪ Dewatering activities to be managed to protect more natural wetlands from sediment laden runoff;
	▪ Pipeline to be backfilled to preconstruction levels;
	▪ Rehabilitation of disturbed areas, re-vegetate with appropriate indigenous species;
	▪ Improve ecological connectivity between the cane field wetlands and the estuary channel;
	▪ Should the re-routing of the proposed preferred pipeline not be feasible to avoid the existing disturbed areas of the cane field, the following offset should be implemented - Rehabilitation of the cane field wetlands in the north eastern corner of the floodplain, as well as
		implement a monitoring programme such as the following. This programme should be updated and modified based on more measured data on turbidity in the Lovu Estuary than presently exists.
		- If operations cause turbidity to increase over an area of more than 20 m (axial length) by more 20 NTU from ambient levels (taken as an average of readings in unaffected upstream and downstream waters) during mouth open conditions, operations should cease and/or immediate remedial measures must be taken. If operations cause turbidity to increase over an area of more than 20 m (axial length) by more 10 NTU from ambient levels (taken as an average of readings in unaffected upstream and downstream waters) during mouth closed conditions, operations should cease and/or immediate remedial measures must be taken

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	the artificially excavated trench just upstream of the N2, to create a broad swathe of naturally vegetated wetland, as far as the estuarine channel, and the rehabilitation of a broad swathe of wetland, within the existing wetland in this area, that has been subject to long-term cultivation; ▪ Measures must be taken to prevent runoff from disturbed construction areas carrying sediments (and other contaminants) into the estuary, e.g. use sandtraps and geotextile blankets. ▪ For tunnelling options (Alternatives 2 and 3), no disposal of excavated material, slurry (including bentonite mixes) wastewater (including waters treated with flocculants) within the floodplain of the estuary or the waterbody. All wastes should be appropriately disposed of (at registered landfill site or recycled if appropriate). OPERATION ▪ Equip the pump station with telemetry to provide early warning of drop in pressure or other signs of pipe leakage or rupture ▪ Repair of leaks to take place with immediate effect and appropriate disposal of leaked saltwater so that it will not affect freshwater ecosystems or other areas sensitive to salinity. ▪ Alternative desalination plant site: ecological buffer areas (25m from rehabilitated watercourse edge) to be maintained, cleared from alien vegetation and clearly demarcated to prevent long-term encroachment of development areas.	
TERRESTRIAL ECOLOGY (next page)		

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
CONSTRUCTION ▪ Comply with Umgeni Water Construction Specification for Environmental Management.	DESIGN PHASE Coastal environment ▪ Undertake pipe jacking or boring as an alternative option to trenching when constructing the sections of the proposed seawater intake and brine discharge pipelines under the dune cordon. A terrestrial ecologist should be involved in the engineering design to confirm the entry and exit location of the pipeline under the dunes ▪ Compile a dune management protocol for the construction, operations and decommissioning phases of the proposed project. ▪ Refine final layout based on direct evaluation on site, e.g. ▪ Establish the pump station at a point landward of the frontal dune cordon in order to maintain dune frontal dynamics (beyond the recommended set back line). ▪ Pipelines from and to the pump station should not be dug within the natural forest in the vicinity of the proposed pump station but rather pipe jacked below the ground surface to avoid vegetation clearing or disturbance. ▪ Limit the amount of infrastructure placed in and around the dune / beach environment during final design of the pumping facility, in particular hard surfaces; ▪ Limit the pump station footprint to 50m x 50m ▪ Ensure an adequate stormwater design. ▪ Position key infrastructure requiring regular maintenance (e.g. venting and purge valves) so as to avoid undue movement onto the dune cordon or into the beach/shore environment. Other mesic environment ▪ Compile an Alien Invasive Vegetation Management Plan for implementation during all phases of the proposed project ▪ Prudent alignment of all pipelines to ensure the avoidance of potential faunal refugia, including steeper slopes and thickets of vegetation.	1. In the event of pipe jacking the pipelines under the dunes, it is also recommended to undertake a monitoring initiative on the dune-beach frontage, prior to construction, in order to assess the extent of the dune toe, back beach and intertidal zone using a number of parameters, i.e. highest tidal extremes (HATOY) and movement of estuary mouth. 2. Undertake a 1m contour survey of the affected dune and beach environment prior to and post construction (e.g. evaluation of the beachform) 3. Identification and delineation of the vegetation line/stable dune frontage using a GPS and monitor transgression. Use quantitative and qualitative measures to measure the state of the frontal dune on a regular basis (e.g. transects, photographic evaluation, general surveys). 4. Monitoring of untoward variation in the topography should be undertaken by management following the cessation of the construction phase.

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	▪ Install bird flight diverters where powerlines traverse valleys or extensive open fields, are proximal to open water or wetland environments and lie adjacent to scarps. <u>CONSTRUCTION</u> <u>Coastal environment</u> ▪ Limit construction footprint to the absolute minimum required. ▪ If required (i.e. if the mouth of the Lovu River trains north during the construction phase), breaching of the mouth of the Lovu River should be undertaken as far south as possible. Advice from suitably qualified and experience estuarine ecologists should be sought on the authorization, timing, duration, nature and location of the breach. ▪ Ensure that within the beach and supratidal beach environment, pipelines are laid at a depth greater than 5m below mean sea level. ▪ Manage entry to the beach and dune environment for all activities (i.e. cordoning off the area). ▪ Where required, sculpting and stabilization re-vegetation of the dune face and the beach / supratidal environment to allow it to revert to its natural state of dynamism and align it with the prevailing topography <u>Other mesic environment</u> ▪ Identify soil horizons (O, A and B) and stockpile according to prevailing horizons during excavation and backfilling. ▪ Where required, re-vegetate open and bare areas using a rapid germination species such as a mix of graminoids (*Digitaria spp ; Eragrostis spp*) or active vegetation with appropriate herb and woody species. ▪ Where possible, use of geofabric stabilising materials or re-vegetation of embankments to address erosion. ▪ Where extensive cut and fill operations are required (i.e. slopes >18˚), appropriate engineering interventions should be considered to address potential erosion risks.	

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	▪ Possible infilling or rectification of extensive depressions or variations in topography to be addressed. ▪ Preliminary review of sites prior to construction to identify fauna that may be traversing or be present within particular areas. OPERATION Coastal environment ▪ If and where possible, avoid the use of engineering defences or other engineering means, and address erosion and mobilisation of dune system through sculpting and revegetation and/or use of geofabric materials. ▪ Stabilise and upgrade existing access point to beach in order to allow for traffic on the beach, if required. A temporary access point can be established and stabilised using geofabric materials. ▪ Implement a traffic management protocol for all staff to avoid undue entry to the beach of staff and in particular, the use of vehicles on the beach. ▪ Limit and manage the mobility of the dune form to allow for natural processes to control such dynamism. Other mesic environment ▪ Generalised land management regimen, including exotic weed control, habitat and vegetation management regimen. ▪ Monitoring and management of pipeline and powerline servitudes for secondary seral growth to facilitate management and maintenance operations, while also allowing for the preservation and enhancement of natural seral processes.	
VISUAL IMPACTS (next page)		

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions

CONSTRUCTION
▪ Comply with Umgeni Water Construction Specification for Environmental Management.
	DESIGN PHASE
	▪ Compile a rehabilitation and erosion control plan.
	▪ Preferred desalination plant site:
	  ▪ Construct site screens at the orphanage north-eastern boundary.
	  ▪ Create a buffer zone of 30 m between orphanage and construction site – to be planted with fast growing indigenous bush and tall trees.
	▪ Alternative desalination plant site: Install retaining walls and structures in high sloping terrain of the Alternative Site in order to prevent erosion scarring and landslides.
	▪ Design the desalination plant and pump station (with emphasis on reducing its discordance with the surrounding landscape) in such a way that the industrial aspects are effectively minimized through architecture (e.g. appropriate colour, design etc.), landscaping (e.g. grading, naturally occurring vegetation, etc.) and vegetation (e.g. maintain existing vegetation, vegetation buffer, etc.).
	▪ Prepare a lighting plan for the proposed desalination plant and pump station that demonstrates that project lighting is effectively shielded from surrounding and adjacent properties.
	▪ Careful location of towers, use wooden towers is possible, minim use of strain towers.
	▪ Where possible, use existing dense and high vegetation as a screen to views of the construction phase.
	
	CONSTRUCTION
	▪ Attempt grading/slopes to recreate or follow the natural terrain by avoiding straight lines and large flat surfaces.
	▪ Whenever practical, use naturally occurring vegetation (native species) for slope stabilization.
	▪ Avoid extensive retaining walls of materials that contrast visually with the landscape.
	▪ Implement lighting plan (e.g. light fixtures that shield the light and
		1. Monitor building, façade and garden maintenance.
		2. Monitor effectiveness of the rehabilitation plan for temporarily cleared areas and erosion scarring.
		3. Monitor the effectiveness of architectural design of the desalination plant and vegetation to
		• screen the public from industrial aspects
		• fit in as the landscape changes from rural to mixed urban-industrial
		• reduce visual intrusion on visual receptors that are changing in sensitivity over time.
		4. Monitor the effectiveness of the lighting plan to minimize light spill and glare.

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	focus illumination on the ground; minimum lamp wattage within safety/security requirements; no elevated lights within safety/security requirements; where possible, use timer switches or motion detectors etc.). OPERATION ▪ Implement a lighting plan and a building and structure maintenance plan. ▪ Maintain a good housekeeping. ▪ Maintain buffer areas clean and timeously attend erosion scarring and landslides.	
NOISE IMPACTS		
DESIGN PHASE ▪ Building walls will be at least 200mm thick with an Rw55-60. ▪ Acoustic attenuation devices will be installed on all ventilation outlets. ▪ No noisy plant and equipment will be contained in buildings that have been cladded in thin sheeting (such as corrugated metal or cement fibre sheets). CONSTRUCTION ▪ Comply with Umgeni Water Construction Specification for Environmental Management.	DESIGN PHASE ▪ Select equipment with lower sound power levels. ▪ Install silencers on fans; suitable mufflers on exhausts and compressor components; acoustic enclosures for equipment to stop noise at source and vibration isolation products for mechanical equipment. ▪ Improve the acoustic performance of buildings by applying sound insulation where possible. ▪ Do not ventilate high pressure gas or liquid directly to the atmosphere, but through an attenuation chamber or device. ▪ Keep the pump station equipment below ground level and fit the ventilation exit points with sound attenuation devices. ▪ Install all high pressure pumps in dedicated enclosed buildings where sound attenuation properties have been considered for the walls, roofs and access doors. CONSTRUCTION ▪ All construction operations should only occur during daylight hours if possible;	1. During the commissioning phase an environmental noise survey is conducted to determine if the noise emissions on the site boundary are within the noise rating limits and to identify potential further mitigation measures, if required. 2. Conduct an environmental noise monitoring survey to assess impacts and recommend further actions if required, and to ensure that the day time noise does not exceed 45dB (A) and the night time noise does not exceed 34 dB(A) at the site boundary (monitor noise as per SANS 10103:2008) • Quarterly during the construction phase • Every 2 years during operation

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	▪ No construction blasting should occur at night. Blasting should only occur during the hottest part of the day to take advantage of unstable atmospheric conditions; and ▪ Blasting should only occur if there are no signs of birds feeding in the immediate vicinity (e.g. flocks of gulls out to the sea) or marine mammals present if blasting is conducted at sea. ▪ Training of staff on use of construction equipment and on presence of fauna ▪ All blasting and piling driving, if required, should only occur during the day. Blasting should only occur during the hottest part of the day to take advantage of unstable atmospheric conditions. OPERATION ▪ Limit vehicle speeds (especially for supply and waste removal vehicles) in and around the plant.	
SOCIO-ECONOMIC IMPACTS		
CONSTRUCTION ▪ Comply with Umgeni Water Construction Specification for Environmental Management.	DESIGN PHASE ▪ Preferred Site: an amicable solution will need to be found to the provision of replacement sports fields for Mother of Peace community. ▪ Alternative Site: Resettlement of a private house located on the proposed alternative site. ▪ Ensure that any pipelines across the Winkelspruit Caravan Park site are not in conflict with current planning for the park. ▪ Develop a Code of Conduct for the project. CONSTRUCTION ▪ Maximise positive impacts through tendering, procurement and employment policies. ▪ Awareness programme for all construction workers at the outset of the construction phase.	

Management actions proposed by the proponent	Key recommended management actions	Monitoring actions
	▪ Establish a Monitoring Forum for the project (key stakeholders, including representatives from the local community, local councillors and the contractor) ▪ In order to limit impacts on local residents along with tourism and recreational stakeholders, the applicant should (a) Inform main commercial and recreational fishing associations (e.g. ski boat clubs) operating in the area and local residents and bodies representing tourism and recreation well in advance of any access restrictions and exclusion zones and (b) Provide information to local media (newspapers and radio stations) informing the public of access restrictions and exclusion zones. ▪ A number of measures are also outlined in the report in order to limit negative social impacts that can be associated with the presence of workers particularly during construction. <u>OPERATION</u> ▪ Maximise positive impacts through tendering, procurement and employment policies. ▪ Enhance local community benefits with a focus on broad-based BEE.	

13.3. CUMULATIVE EFFECTS

Cumulative impact are defined as the impact on the environment, which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ, 1997). Bear in mind also that the distinction between cumulative and other impacts is often difficult to make. The assessment of cumulative impacts is also generally more difficult primarily as they often require more onerous assumptions regarding the likely actions of others.

It is expected that the project would facilitate further development in the wider area through the potential to influence investors (including locals) due to the availability of water supply which is a pre-requisite for such development. This would result in cumulative **positive** impacts of **medium** to **high** significance on overall investment levels. In a sense the project has the potential to lead to the 'crowding in' of further investment. Note that this is not a differentiating factor with regard to project alternatives – i.e. all alternatives considered would result in similar cumulative impacts in this regard. Note also that in the medium to longer term this is likely to include more development in the general vicinity of the Mother of Peace Children's Home as per the Illovo South Local Area Plan (LAP).

Concerns have however been raised that the proposed development would open the way for more industrial development in the immediate vicinity of the site. It is not possible to predict outcomes in this regard as future land use will depend on developer interest and what the Municipality approves. Residential development is, however, currently indicated in municipal planning for the area surrounding the site.

From a coastal and marine environmental perspective, the proposed intake/discharge sites cannot be considered particularly "pristine". The coastline is relatively uniform over the 1-1.5 km stretch under consideration, has undergone substantial developments over the past decades and is already impacted by seasonally high visitor numbers who utilize the area primarily for coastal recreation, rock- and surf-angling and kite-surfing. Water and sediment quality have no doubt already been compromised by the various marine outfalls along the coast. Likewise, the river water shows measurable anthropogenic contamination due to discharges from wastewater treatment plants within the river's catchment areas. Therefore, given the current past and future proposed development along the coastline of the project area, cumulative impacts associated with disturbances to marine or coastal systems or features as well as cumulative impacts on fishing and water based recreation can be expected. This should be kept in mind during any monitoring studies undertaken as part of this (or any other similar) project.

In addition, with the establishment of the proposed pump station, increased pedestrian traffic is expected within the beach environment. Such impacts can be considered to be of low significance and highly reversible, on account of the fact that low human intrusion is likely to arise in comparison to other beach environments and such intrusions on account of maintenance and management, are likely to be intermittent. If impacts are identified during

operations, it is highly likely that such impacts can be reversed by increasing management protocols around access to the beach.

In terms of aquatic ecology, the extensive fragmentation and cultivation of natural freshwater wetlands on the floodplain within broad transformed landscapes, augmented by the permanent loss of opportunities to rehabilitate these to estuarine corridors, in particular within cane field environments in the Lovu estuary is a key concern. In addition to the recommended rehabilitation of a broad swathe of the cultivated wetland, it is suggested to also rehabilitate the cane field wetlands in the north eastern corner of the floodplain, as well as the artificially excavated trench just upstream of the N2, to create a broad swathe of naturally vegetated wetland, as far as the estuarine channel, and the rehabilitation of a broad swathe of wetland, within the existing wetland in this area, that has been subject to long-term cultivation. This additional recommendation is however not considered essential.

The bulk of the affected mesic environment presently lies under cultivated lands. Such lands are subject to regular and catastrophic disturbance effectively placing them under a dynamic regime which establishes an early seral stage of a secondary coastal habitat. As such, cumulative impacts will relate to the loss of unencumbered farmlands to urban / service infrastructure.

The cumulative impact on the landscape of the desalination plant and other future developments as suggested in the Local Area Plan for Illovo South (the area in which the desalination plant will be located) will be low with effective mitigation since the future landscape character will be mixed urban with residential, industrial and commercial elements. Similarly, the cumulative visual impact on sensitive visual receptors is anticipated to be of low significance if the LAP is developed as outlined, in which case industrial structures and developments will be familiar elements of views. The recommended mitigation measures are likely to make the desalination plant fit at least partially into the mixed residential district proposed for the sites in the LAP.

Aside from issues discussed above, cumulative impacts on tourism and property values are expected to be driven primarily by cumulative visual, noise and ecological impacts.

The combined effects of the above findings indicate **low** to **medium** risks of cumulative impacts.

13.4. CONSIDERATION OF ALTERNATIVES

13.4.1. NO GO alternative

The no-go alternative assumes that the project as proposed does not go ahead. This alternative provides the baseline against which other alternatives are compared and will be considered throughout the report. The implications of the "no project" alternative are that:

- The land-use remains as Agriculture;
- There is no development the proposed location;

- There is no change in the landscape;
- Alternative and possibly more expensive water supply schemes will be developed;
- Water will become more expensive and possibly more scarce in the region and water reduction strategies will have to be enforced e.g. the watering of gardens will be prohibited;
- Industrial development in the region will be stunted under the growing concern for water; and
- Private and public sector industries will implement their own smaller-scale desalination facilities, leading to many RO plants with multiple intake and outfall (brine discharge) infrastructure components in the region.

The main implication of the no go alternative is the lack of adequate water supply to the region. Umgeni Water has a mandate to provide adequate safe potable water and not implementing this project could impact on that duty. Further, as conventional water resources near their full potential, the region will face serious challenges in terms of sustaining the economic growth envisaged for the region.

In order to assess the "No-Go" alternative it must be assumed that the projected inadequate assurance of water supply that informed the project planning will persist and water supplies would remain under increasing pressure in terms of ensuring potable water to residents and sustaining economic growth in the region.

The no-go would have no impact in the locality relative to these benefits as there would be no expenditure injection. Water supply needs would still, however, need to be met even if the project does not go ahead. To a degree, expenditure that would have flowed from the project would therefore essentially be 'replaced' by expenditure on other water supply projects that will have to go ahead in order to supply water to the wider area. For this reason, impacts associated with expenditure should not be treated as a key decision factor.

Apart from the no-go alternative, other types of alternatives were considered in the pre-feasibility planning for this project and as part of this EIA process. The analysis of the various alternatives is presented in Chapters 2 of this EIA Report, with a summary provided below:

13.4.2. Location alternatives

As highlighted in Chapter 2, an ESS was used to assess 6 potential site locations between Durban and Scottburgh in terms of ecological and social sensitivity to the receiving marine and terrestrial environments, as well as project technical requirements. Based on the findings of the multi-criteria analysis, one area at Lovu was selected (where two site alternatives for the desalination plant are being investigated). The preferred site and alternative site, both located outside the estuary on the southern bank of the Lovu River are addressed in this EIA. A description of each alternative in terms of impact assessment is provided in the relevant specialist studies.

13.4.3. Layout Alternatives

13.4.3.1. Sea Water Pipelines

The sea water pipelines extending between the proposed sea water pump station and the desalination plant consists of four different routing alternatives that have been assessed as part of this EIA Process. These alternative routings (including Preferred Pipeline Routing, Pipeline Route Alternative 1, Pipeline Route Alternative 2 and Pipeline Route Alternative 3) are described in detail in Chapter 2 of this Final EIA report. A description of each alternative in terms of impact assessment is provided in the relevant specialist studies.

13.4.3.2. Potable Water Pipeline Alternatives

As highlighted in Chapter 2, the siting of the proposed Lovu Desalination Plant is immediately adjacent to an existing bulk water pipeline. The close proximity of the proposed Lovu Desalination Plant to this existing bulk water infrastructure will require that the length of new potable water pipeline will be minimal. Therefore, additional routing alternatives for the potable water pipelines will not be assessed in this EIA.

13.4.4. Technology alternatives as part of the development

The technology proposed for the construction and operation of the desalination plant will be guided by industry standards and global best practice. The applicable technology alternatives for this project relate to the infrastructure being installed and constructed. As noted above, a detailed feasibility study was undertaken by the applicant. The study assessed the various technology and design options for the proposed project and recommended (technically, economically and environmentally) feasible options to be considered during the detailed design phase. The following technical and design alternatives have been discussed in this chapter based on the detailed feasibility study:

- Sea abstraction (surface intake) versus beach well abstraction (subsurface intake);
- Surface intake screen types;
- A variation of pipeline technologies;
- A number or alternatives are possible for the best concentrate management e.g. the combination of waste streams;
- Rosette or pipeline diffuser alternatives; and
- Operational sludge strategy, e.g. co-discharge with return brine or disposal at landfill.

13.5. PERMITS AND LICENCES

13.5.1. Environmental Authorisation

Before clearing of the proposed site is initiated, the appropriate environmental authorisation must be obtained in terms of the National Environmental Management Act (NEMA) and associated EIA Regulations, 2010.

13.5.2. Terrestrial Ecology

13.5.2.1. Removal of protected species

In terms of the National Forests Act, 1998 (Act No 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a license from the Department of Agriculture, Forestry and Fisheries (DAFF).

- **Protected Trees**. Protected trees, (in particular *Mimusops caffra* and *Sideroxylon inerme*), which are listed in terms of the Act, require permit applications if they are to be removed. Such specimens are to be identified in respect of the final layout of the proposed pump station, to identify whether there is a need to apply for such permit.
- **Clearance of Natural Forest**. Where "three or more indigenous trees form a contiguous canopy" the legal definition of "forest" applies. If "forest" is to be disturbed then a permit is required prior to such disturbance. In this regard, a permit is likely to be required in and around the proposed pump station and in association with the caravan park, as well as other points along the proposed pipeline routes.

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. Threatened or Protected Species (T.o.P.S) in terms of the National Environmental Management: Biodiversity Act (No. 10 of 2004), the KZN Provincial Nature Conservation Ordinance (1974) and the KZN Provincial Conservation Act (Act 29 of 1992) identify a number of threatened or protected species that require consideration and permitting, before their removal or destruction. Such permit requirements will apply to, in particular, species within the wetland environments. If a permit is required (e.g. *Hibiscus tiliaceus*) from the Provincial conservation body, *Ezemvelo* KZN Wildlife should be contacted.

13.5.2.2. The Integrated Coastal Management Act (Act 24 of 2008 & Act 36 of 2014) (ICMA)

In terms of Section 69 of the ICMA, discharge of materials into the sea from a terrestrial source requires a discharge permit. The nature of the discharge and other requirements must be considered by the Directorate: Coastal Pollution Management, Department of Environmental Affairs (Branch: Oceans & Coasts) prior to the issuing of a permit.

13.5.2.3. The Conservation of Agricultural Resources Act (43 of 1983)

The control of agricultural land and its transformation to other land uses fall under the jurisdiction of this Act. An application for the release of agricultural land, particularly in respect of the establishment of the SWRO plant, will require the authorization of the Minister. An application should be sent to the Department of Agriculture Forestry and Fisheries.

13.5.2.4. Off Road Vehicles Regulations of 1998 (GN 1379)

The control of vehicles within the coastal zone is governed by the ORV regulations of NEMA, published in 2001 GN 1379 December 2004. These regulations serve to govern the operation of vehicles on the beach and dune forms of the coast. A permit will be required in order to place a vehicle on the beach.

13.5.3. Water Use

A Water Use License will be required in terms of Section 21 of the Water Act (Act 36 of 1998) as a result of the proximity to or the crossing of watercourses in the area. This requirement has been confirmed with DWA during a pre-application meeting on 17 November 2015. The WULA application is being compiled and will be submitted to the Department of Water Affairs after submission of the Final EIA report to account for feedback from DWA.

Activities that would definitely trigger either GA registration or WULA requirements would include:

- Construction of the proposed desalination plant within 500m of a wetland – the Lovu Estuary is associated with floodplain wetlands;
- Excavation of pipelines through or within 500m of a wetland – this would apply to all alternatives;
- Construction of transmission lines across wetlands or rivers;
- Passage of pipelines across wetlands or rivers – the pipeline alternatives (preferred route and Alternatives 1 and 3) would both cross watercourse 1 (note that watercourse 2 is not considered natural and would thus not require authorization through the NWA);
- The construction of a bridge across the estuary;
- The proposed potable water storage reservoirs (2 x 37.5Ml), as their storage capacity exceeds 10 000 m^3

13.5.4. Heritage

In terms of Sections 35(4) of the National Heritage Resources Act 25 of 1999, should any archaeological or palaeontological materials/sites be found during construction of the proposed facility, a permit must be obtained from the South African Heritage Resources Agency (SAHRA) to remove such remains. Such removal should be undertaken by a professional archaeologist/palaeontologist.

In terms of Sections 36(3) (a) of the National Heritage Resources Act 25 of 1999, a permit will be required for the relocation of graves, if any are identified during construction activities.

13.6. OVERALL EVALUATION OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Population projections in South Africa estimate that the population will grow to 53 million by 2025 and with it water demand will rise. Rapid rates of urbanisation will place stress on existing water infrastructure. South Africa is generally a water scarce country. Large dams are required to store water for cities, especially during droughts. Much of the easily available water resources are now almost totally developed – the Mgeni Catchment in KZN is a typical example of this and now has four large dams.

According to the South African National Water Resource Strategy (DWA, 2013), South Africa faces serious water challenges in the near future if the economic growth envisaged for the country is to be sustained. As conventional water resources near their full yield potential and with climate change likely to increase the risks associated with water supply, the attention is slowly focusing on sea water desalination as one of the solutions to the looming water crisis in many South African coastal towns and cities.

The Department of Water and Sanitation's Reconciliation Strategy Study for the Kwazulu-Natal Metropolitan Coastal Areas indicates that even with further augmentation of the Mgeni System (including the implementation of Spring Grove Dam and the planned Mooi-Mgeni Transfer Scheme Phase 2), the supply of water in future will still not exceed the required 99% assurance of supply. Phase 1 of the proposed uMkhomazi Water Project (i.e. Development of Smithfield Dam) is planned to secure an additional 600 Ml/d. However the latter would not be able to augment the supply to the South Coast. The capital cost of the proposed dam, delivery tunnel and other infrastructure would be about R17 billion and the scheme would take many years to construct. Therefore Umgeni Water identified a 150 Ml/day sea water desalination plant in the Lovu area using RO technology as a possible short-medium term alternative that could be implemented fairly quickly to meet the growing water demand and ensure the sustainable economic development of the region. The off channel Ngwadini Dam that would be supplied with water abstracted from the lower reaches of the uMkhomazi River was subsequently identified as an alternative option and a feasibility study of this project is also being undertaken by Umgeni Water as part of their 100Ml/d Lower uMkhomazi Bulk Water Supply Scheme Project.

In accordance with the Guideline on Need and Desirability published in the Government Gazette of 20 October 2014 (GN No 38108), this EIA considered the nature, scale and location of the development as well as the wise use of land (i.e. is this the right time and place for the development of this proposed project).

Section 24 of the Constitutional Act states that "everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that –

i) Prevents pollution and ecological degradation;

ii) Promotes conservation; and

iii) Secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

This EIA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site and through appropriate monitoring and management plans to, inter alia, monitor the impacts on marine ecology associated with the discharge of brine and protection of freshwater features present within this area (refer to the draft EMPr).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the areas nearest to the project site (refer to Sections 13.1.1 and 13.1.7). The EIA has investigated and assessed the significance of the predicted positive and negative impacts associated with the proposed Desalination Facility. No negative impacts have been identified within the ambient of this EIA that, in the opinion of the Environmental Assessment Practitioner, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project.

There are undoubtedly a range of complex socio-ecological issues that emerge out of the need to supply potable water to a growing and developing population from behavioural questions relating to water consumption patterns to the complex water/electricity nexus associated with SWRO plants. Many of these questions have not been addressed within the scope of this EIA as they fall within the ambit of national and provincial planning departments. The evidence that has been provided to the EAP consisting of feasibility studies that have motivated for the development of the desalination alternative above all other water augmentation strategies and the subsequent environmental evidence presented by the specialist studies within this EIA have lead to the following recommendation:

After due consideration of the proposed development, associated impacts identified and assessed by specialists during the EIA process (including inputs from the local community): the EAP recommends that the proposed 150 Ml/day SWRO facility receives the appropriate Environmental Authorisation from the Department of Environmental Affairs on the conditions that key management and monitoring actions are implemented in order to mitigate the main potential impacts of the project. This recommendation applies to the *Preferred location* for the desalination plant and the *Preferred seawater intake and brine discharge pipeline route or the Alternative 3 pipeline route*.

However, as previously mentioned, if the Preferred Site is chosen an amicable solution will need to be found to replace the sports fields for the Mother of Peace Children's Home. It should be noted that if this agreement does not conclude, the Alternative site has also been assessed in this EIA as a suitable site for the proposed development, providing that the recommended key management actions are effectively implemented. It is therefore recommended that both locations (*Preferred and Alternative Sites*) be considered for the Environmental authorisation in

order to make room for negotiations with Illovo and Mother of Peace during the detailed engineering design phase of the project.

In order to ensure the effective implementation of the mitigation and management actions, a framework **Environmental Management Plan (EMP)** has been prepared for the construction and operation of the proposed project (Part B of the EIA Report). It is proposed that the draft EMPr be finalised, following input and comments from various stakeholders and authorities, and be implemented during all phases of this project.

All the required permits, licenses (including a CWDP and WULA) and authorisations (including an EA) will be obtained prior to the construction of this facility (as discussed in Section 13.5). Note that the proposed plant location will also need to be re-zoned.