SUBMISSION TO DEPARTMENT OF ENVIRONMENTAL AFFAIRS
FOR AN AMENDMENT TO RECORD OF DECISION FOR COEGA IDZ (Industrial Water Use)

1. INTRODUCTION

1.1 Background

The Coega Development Corporation (CDC) is commissioned by the South African Government to establish the Coega Industrial Development Zone with the associated deep-water port at the mouth of the Coega River. The Coega Industrial Development Zone (IDZ) is situated approximately 20 km north east of Port Elizabeth in the Eastern Cape Province.

The Coega IDZ comprises approximately 11 500 hectares of land to be developed in phases with the Core Development Area (CDA) of 6500 ha being the initial focus.

The Minister of National Department of Environmental Affairs and Tourism in a letter dated 27 May 2002 issued a Record of Decision [ROD] for the rezoning and development of the Coega IDZ. The ROD was approved upon inter alia, a condition set in Section 9.2.5 (page 99) of the Final EIA Report, namely that the IDZ shall make use of treated sewage effluent as a source of industrial water supply, namely that "A dual reticulation system will be provided for the CDA – one for potable water and the other for treated/recycled sewage effluent."

This report addresses the particular requirements, timing and phasing of an industrial water supply to the Coega Industrial Development Zone, based on the expected industrial development, project programming and financial viability of such a return effluent scheme.

1.2 Nomenclature

The nomenclature used in the contents to follow, is scheduled as follows:

AADD	Annual Average Daily Demand (water)
CDC	Coega Development Corporation
DEAET	Department of Environmental Affairs and Tourism
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
FWF WWTW	Fish Water Flats Waste Water Treatment Works
IDZ	Industrial Development Zone
MNF	Minimum Night Flows
M&E	Mechanical and electrical
NCLLS	Nooitgedagt/ Coega Low Level Scheme
NHLS	Nooitgedagt High Level Scheme
ORDP	Orange River Development Project
PPP	Public Private Partnership

PWD	Peak Week Demand
RE	Return Effluent
ROD	Record of Decision
SDF	Spatial Development Framework
TDS	Total Dissolved Solids
WMP2006	Water Master Plan 2006
WSDP	Water Services Development Plan
WSA	Water Services Authority
WSP	Water Services Provider
WTW	Water Treatment Works
WWTW	Waste Water Treatment Works

2. WATER SUPPLY AUGMENTATION OPTIONS (for Algoa Water Supply Area)

2.1 Water Reconciliation Study [DWA 2010]

The DWA study, Water Reconciliation Strategy Study for the Algoa Water Supply Area, was completed in 2010. The purpose of this document was firstly to describe the current water balance situation of the AWSS, and to develop potential future water balance scenarios. It further aims to describe the proposed actions, and the associated responsibilities and timing of such actions that are urgently needed to prevent the risk of a water shortage becoming unacceptable. The Reconciliation Strategy evaluated the long-term needs to address the water requirements up to 2035.

Selection of interventions

A significant number of potential interventions, which could contribute to meeting the future water requirements of the AWSS, were initially identified from previous and on-going studies, with the inclusion of several newly formulated interventions.

The interventions that were considered for the Strategy following preliminary screening are the following:

Table 10: Interventions considered for the NMBM Water Reconciliation Strategy

Intervention	Description of intervention
URBAN WATER CONSERVATION AND DEMAND MANAGEMENT	
WC/WDM upstream/ downstream of user meters	Continued roll-out of an active WC/WDM programme within NMBM, controlled by a full-time manager, and implementation of the existing WC/WDM programme and new WC/WDM activities.
Rainwater harvesting	Collection of rainwater from roofs, primarily for toilet flushing. The collection of rainwater for supplementing of garden water use is deemed as an extension of this option.
TRADING OF WATER USE AUTHORISATIONS	

Water trading – upper Great Fish River	Purchasing of water use entitlements from farmers using Orange River water in the upper Great Fish River, to be supplied to NMBM via the Nooitgedagt abstraction infrastructure.
Water trading - Baviaanskloof River	Purchasing of water use entitlements from farmers in the Baviaanskloof River valley, to be supplied to NMBM via the existing Kouga/Loerie system.
LAND USE CHANGES	
Removal of alien invasive plants	Programmes to remove invasive alien plants in the catchments of the Kromme, Kouga and Baviaanskloof rivers.
RE-USE OF WATER	
Re-use of water treated to industrial standards – Coega WWTW	Re-use of water treated at the future Coega WWTW, to meet requirements for industrial quality water within the Coega IDZ. This has been set by the Eastern Cape Department of Economic Affairs, Environment and Tourism (DEAET) as a condition of water supply to the Coega IDZ.
Re-use of water treated to industrial standards – Fish Water Flats WWTW	Re-use of water treated at the Fish Water Flats WWTW, to meet requirements for industrial quality water within the Coega IDZ. This has been set by the Eastern Cape Department of Economic Affairs, Environment and Tourism (DEAET) as a condition of water supply to the Coega IDZ.
Re-use of water treated to potable standards	Potable re-use of water treated at the Fish Water Flats (and possibly Uitenhage and Despatch WWTWs) through the reverse osmosis process, stored in a proposed new dam at Echodale on the Elands River and treated at a new water treatment works.
DESALINATION	
CDC Supply Option	Purchasing of potable water by NMBM of reverse-osmosis desalinated seawater, as a by-product of the process at the Straits Chemicals chlor-alkali plant. This option is also dependent on the construction of a bulk seawater intake system for the Coega IDZ.
Lower Sundays River return flows	Abstraction of return flows in the Sundays River downstream of the Sundays River Water User Association, desalination, and blending at Olifantskop reservoirs with treated Orange River water supplied from the Nooitgedagt WTW.
Desalination of seawater	Supply via a bulk seawater intake system for multiple potential sea water users within the Coega IDZ area, pumping sea water via pipeline to the proposed RO plant site (to be shared with the planned Coega WWTW).
GROUNDWATER AUGMENTATION SCHEMES	
Fast-tracked groundwater schemes: - Jeffreys Arch - Van Stadens - Bushy Park - South-eastern Coega fault	Fast-tracked implementation of the Jeffreys Arch, Van Stadens River Mouth, Bushy Park and the South-eastern Coega fault new groundwater schemes. Some of these schemes could either supply NMBM or alternatively supply small coastal towns, freeing up water for NMBM.
SURFACE WATER AUGMENTATION SCHEMES	
Maximising yield of the existing Kouga/Loerie Scheme *Implemented*	Lowering of the operational level to which water can be abstracted from Loerie Dam from 80% to 40% to increase the yield, requiring no additional infrastructure or operating staff, but improved operation and increased periods of pumping at maximum capacity.
ORDP/Nooitgedagt Low-Level Scheme *Under Implementation*	Increased supply from the Orange River to NMBM, supplied from Nooitgedagt Water Treatment Works (WTW) via a new pipeline to the Olifantskop Reservoir. This scheme would also offer significant energy savings on account of the reduced pumping heads needed

Abstraction of lower Gamtoos River flows	Abstraction of return flows by NMBM downstream of the largest irrigation component of the Gamtoos Irrigation Board (upstream of the tidal river zone) and pumping this water into the Loerie Dam for blending with water from Kouga Dam
Guernakop Dam on the Kouga River	Construction of a new 83 m high rollcrete dam at Guernakop approximately 15 km upstream of the upper end of Kouga Dam on the Kouga River.
Kouga Dam on the Kouga River replacement and raising	Construction of a mass gravity rollcrete dam immediately downstream of the existing Kouga Dam and doubling of the capacities of the Loerie WTW and the pipelines to NMBM.
Tsitsikamma River Diversion to Impofu Dam	Diversion of flows from a low diversion weir on the lower Tsitsikamma River, pumping water to a high point, from where the water would gravitate via pipeline into a stream which flows into Impofu Dam. The water would be treated at the Elandsjagt WTW and distributed through existing infrastructure.

Since the above study was completed, the following projects (shown in green above) have been implemented:

(a) "Maximising of the existing Kouga/Loerie scheme"

The minimum operating level of the Loerie Dam was lowered from 80% to 40% as a revised operating rule (poor water quality resulted from lower levels) during the Emergency stages of the drought. This operating rule has been implemented as a permanent rule and resulted in an estimated additional 13-15 Ml/day from this source at no additional cost to NMBM (refer Section 2.1.1); and

(b) The ORDP/Nooitgedagt Low-level scheme is under construction at a total project cost of R730 million to increase the nominal 70 Ml/day WTW output to 160 Ml/day and the peak transfer capacity from the ORP system from 95 Ml/day to 210 Ml/day.

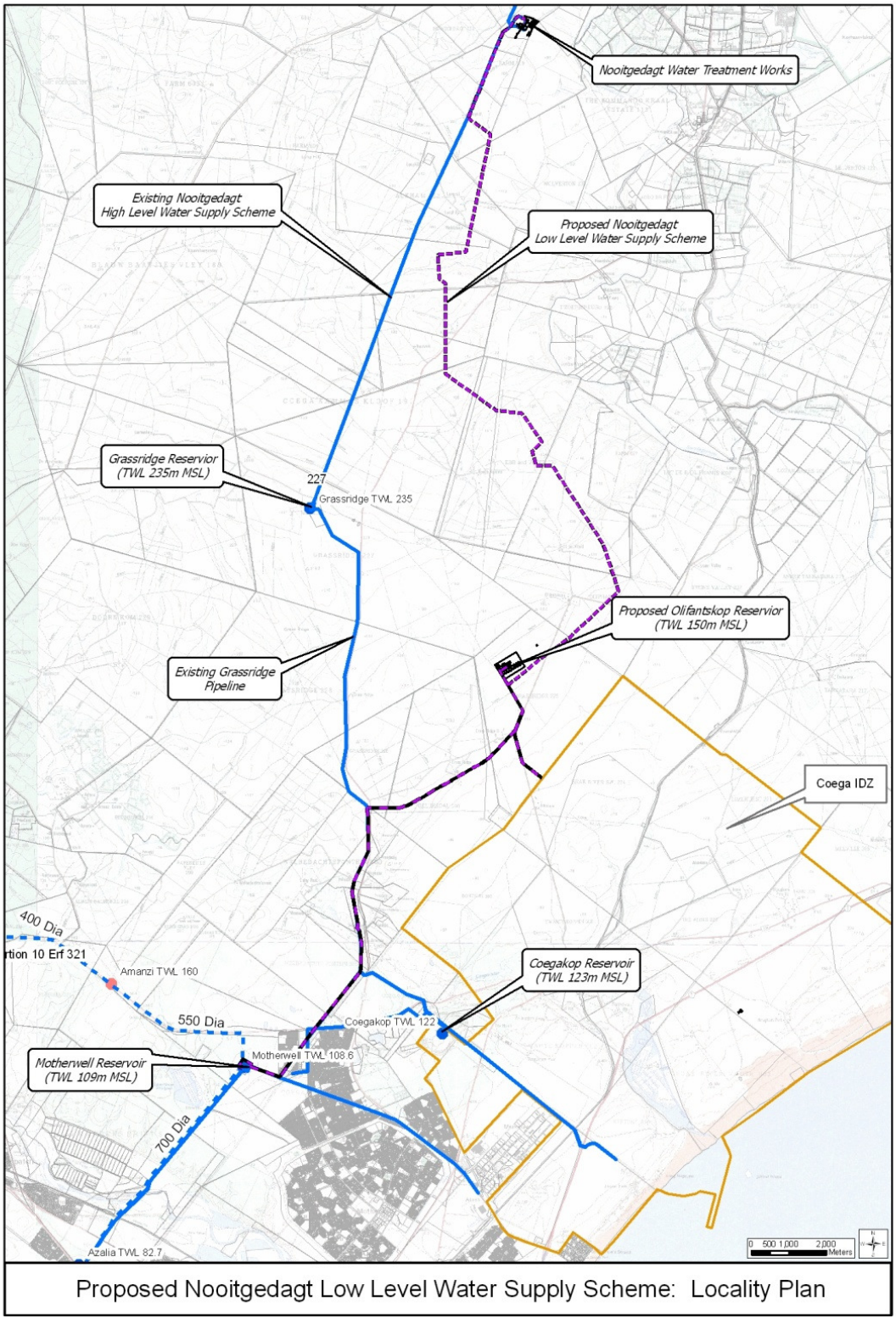
2.2 Nooitgedagt/Coega Low Level Scheme [Potable Water Supply]

This scheme has been planned and designed in terms of the recommendations made by the WMP2006 and consists of the following main elements:

- Extension of the Nooitgedagt WTW from present average capacity of 70 Ml/d (peak 91 Ml/d) to an average capacity of **160 Ml/d** (peak 210 Ml/d) and increased medium voltage transformer capacity.

- A low lift pump station and rising pipeline (1.3m diameter x 19.1 km) sized for 120 Ml/day (122m pump head) transfer capacity pipeline to follow the high lift pipeline route for some 10Km from Nooitgedagt, then to turn east and follow a new route for some 8.7 Km.

Figure 2: Layout Plan for Nooitgedagt / Coega Low Level Water Scheme



Proposed Nooitgedagt Low Level Water Supply Scheme: Locality Plan

- Balancing storage sited on farm Olifantskop with TWL 150m MSL. A first 10 Ml capacity reservoir to be constructed under the emergency project (immediate) and a 45 Ml capacity reservoir to follow which will ensure reliable balancing capacity for the Coega IDZ.

- Gravity pipeline (1.5m diameter x 4.6Km) to follow the existing gravel access road north of the IDZ, a 1.0m diameter branch pipeline up to the IDZ boundary and a 1.3m diameter pipeline following the gravel access road up the existing 1.1m diameter high level pipeline, from where the two pipelines will run parallel in the same servitude up to the present 800mm diameter pipeline off-take from Grassridge/ Motherwell pipeline to Coega Kop reservoir. A new off-take from this Olifanstskop gravity pipeline will feed water into the 800mm and into Coegakop reservoir (TWL 122m MSL). From this point a 1.1m diameter x 4.2Km pipeline will follow the same route and servitude as the present 1.1m diameter x 18.7 km Grassridge pipeline up to the Motherwell reservoir.

- A booster pump station at Motherwell reservoir (maximum 42Ml/day x 85m lift) which will divert "surplus" water transferred along the Low Level Scheme into the High level Scheme as and when required by operational demands.

- A booster pump station on the Motherwell /Chelsea pipeline system at Stanford Road (maximum 90Ml/day x 96m lift) which will replace the existing Bethelsdorp booster pump station and which will transfer water from the ORP system onto Chelsea reservoir as and when required by operational conditions.

The estimated cost for the NCLLS is summarised as follows:

Table 11: Estimated Project Budget – Nooitgedagt/Coega Low Level Scheme					
Financial year	< 2010/11	2010/11	2011/12	2012/13	2013/14
Annual Costs (R x 1000)	R 23,980	R 35,140	R 362,000	R 273,000	R 42,000
			Project Total Cost		R736,120

During the severe drought of 2008-2011, NMBM secured emergency funding in the amount of R450 million from National Government. However, in order to complete the above scheme, a further R 256 million is required. To date, NMBM could not secure the funding which has resulted in a project completion delay.

The anticipated completion of the increased potable water supply is December 2013/January 2014.

2.3 Proposed RE Scheme – Industrial Water Supply to Coega IDZ

Table 12: Industrial Water Sources considered for Coega IDZ
(NMBM Reclaimed Industrial Supply Scheme – Feasibility Report - 2010)

Source	Year - Flow (Ml /day)			
	2010	**2015**	**2020**	**2040**
Total Coega WWTW	13.3	38.0	63.6	72.7
Total Fish Water Flats WWTW	105.2	123.7	119.6	119.6
TOTAL	**118.5**	**161.7**	**183.1**	**192.2**

Of the various supplies available, the FWF WWTW supply has been identified as the most obvious source of effluent for Phase 1 (60 Ml/day), as there is sufficient water available to treat and it is geographically reasonably well placed in relation to the Coega IDZ. For Phase 2 industrial effluent supply, RE will be sourced from the future WWTW to be located within the Coega IDZ.

It is proposed that Phase 1 of the supply will be sourced from the FWF WWTW and pumped via a rising main to a storage facility at Olifantskop in the IDZ. For the preliminary design the following was assumed:

- Daily demand for industrial water of 60 Ml/day.
- Category 4 industrial water required.
- Off-peak pumping of industrial water from FWF to the Olifantskop storage reservoir (18 hours per day).
- Storage of 8 hours provided for industrial water at FWF to cater for the off-peak pumping.
- Single 900 mm dia rising main from FWF to Olifantskop.
- 48 hours (2 days) storage provided at Olifantskop.
- A single 900 mm dia gravity line supplying the IDZ.

To produce a Category 4 industrial water, additional treatment steps will be required to treat the existing FWF effluent. This will be achieved by implementing ultra filtration by converting the existing wastewater treatment works into a Membrane Biological Reactor (MBR) works. The additional treatment steps are indicated in green in the process diagram below:

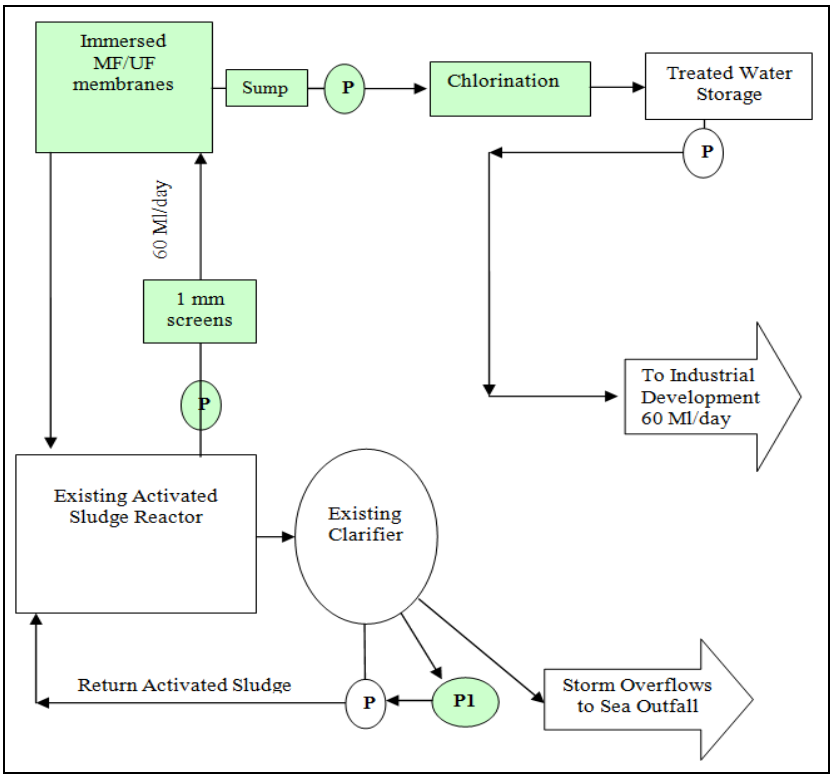


Figure 3: Proposed Category 4 Treatment Process

Once the effluent has been treated it will be stored in a storage reservoir at the FWF treatment works and pumped during of peak periods to the Oliphants Kop storage facility. This will require a high lift pump station and 900 mm dia rising main to transfer the 60 Ml /day industrial water to the IDZ.

At Oliphantskop a 120Ml reservoir will provide 48 hours storage for the water which will be gravity fed to the IDZ via a 900mm dia pipeline.

The scheme is graphically illustrated in figure 4 below.

The NMBM Feasibility Study confirmed that a category 4 industrial water could be supplied at a cost of R4.52/kl, whereas a Category 3 water could cost as much a R 8.79/kl (2009).

Category 4 industrial water could thus be supplied at less than potable water cost and industries would be required to do onsite treatment for the portion of industrial water which is required at improved quality standards. The actual water quality is near class 3, except for the chloride values that put it into class 4 water quality.

The capital cost of the Stage 1 project as shown on Figure 4, updated to 2012 present day costs, amounts to some **R1,160million.**

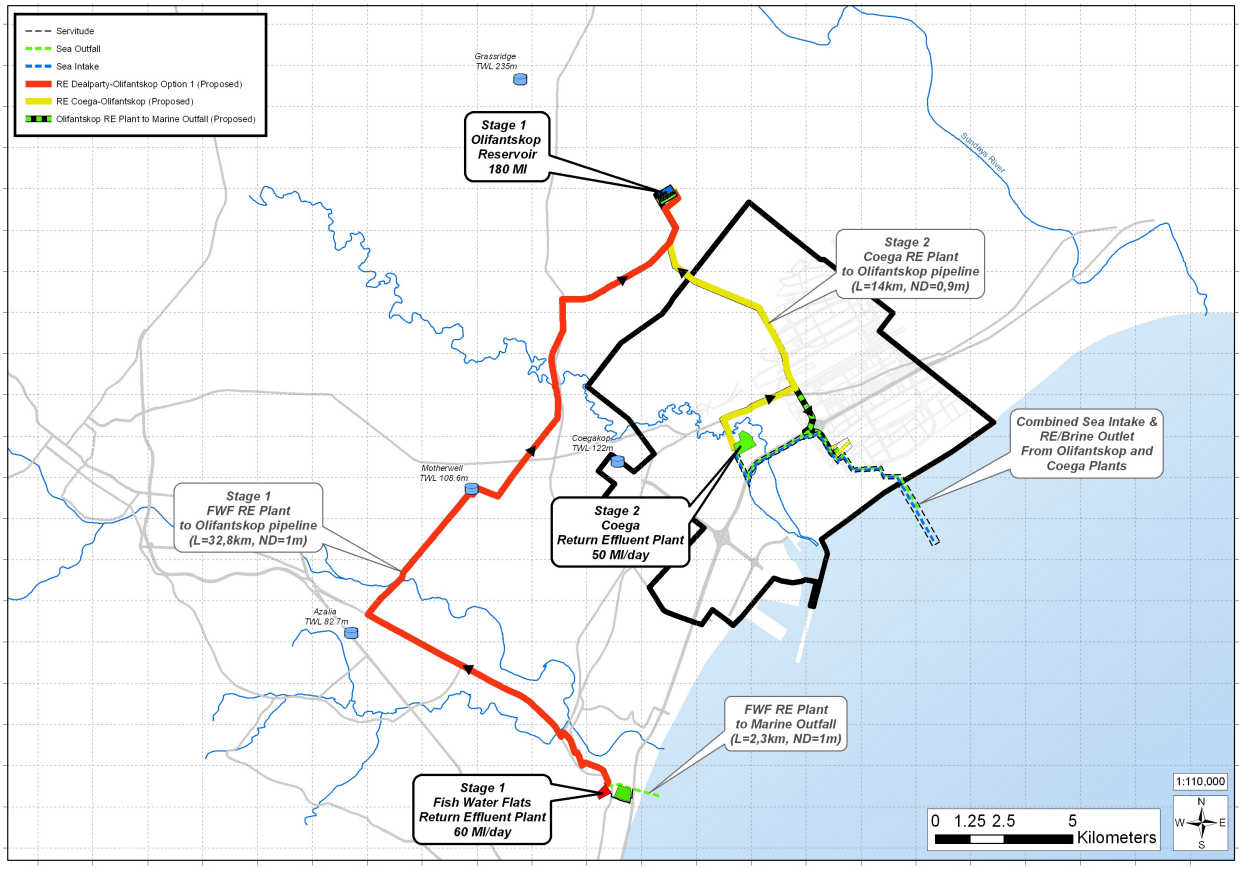


Figure 4: Proposed Coega Industrial Water Scheme Scheme – Stage 1 & 2

A team of consultants for the implementation of this project has been appointed and the feasibility study is presently been undertaken. The project EIA process has been lodged during 2010 and a Record of Decision is expected before June 2012.

In terms of the NMBM potable and industrial water demands as depicted in Figure 1.2, the industrial water scheme should be commissioned by latest in 2017 with construction starting before June 2015. Design and water quality validations (for process design) should start before January 2013.

Table 14: Estimated Project Budget – Coega Industrial Water Supply – Phase 1 (60 Ml/day)					
Financial year	2012/13	2013/14	2014/15	2015/16	2016/17
Annual Costs (R x 1000)	R 3,000	R 45,000	R 450,000	R 550,000	R 112,000
			Project Total Cost		R1,160,000

The cost for Phase 2 industrial supply to the IDZ will be directly affected by the final process design at the future Coega WWTW which will determine what post treatment processes will be required and whether a Category 4 industrial water is still acceptable to industries within the IDZ.

The phasing of the Phase 2 industrial water supply will be determined by the rate of industrial development to follow after 2017/18 and their industrial water demands.

3. FUTURE WATER DEMAND

Figure 1.2 demonstrates the predicted future water demand envelope for the NMBM supply system based on historical water use without the demand impacts resulting from the Coega IDZ (upper and lower boundaries of a projection envelope developed over 35 years water demand history).

The Coega IDZ will add additional potable and industrial water demands onto the bulk supply system of the NMBM as discussed in Section 1.4.5 above. Some 31 Ml/day potable and 53 Ml/day industrial water is the predicted demands by 2020 and these demands have been reflected in Figure 1.2.

The NMBM future demand curve includes the potable water demand expected from the IDZ industrial developers as well as the higher overall demand growth rate for NMBM resulting from economic growth expected to follow on the IDZ development growth (estimated to be 2.5% per annum whereas the NMBM long term historical demand growth was some 2.3% per annum). A separate demand line (green) shows the industrial water demand in addition to the NMBM potable demand.

As discussed above, the required industrial water supply to meet the Coega IDZ demand will probably only become available during 2016/17. Figure 1.2 illustrates that for the period 2013 to 2016, the demand for industrial water can be bridged by a temporary potable supply from the Olifantskop reservoir site from surplus potable water capacity being available within the system.

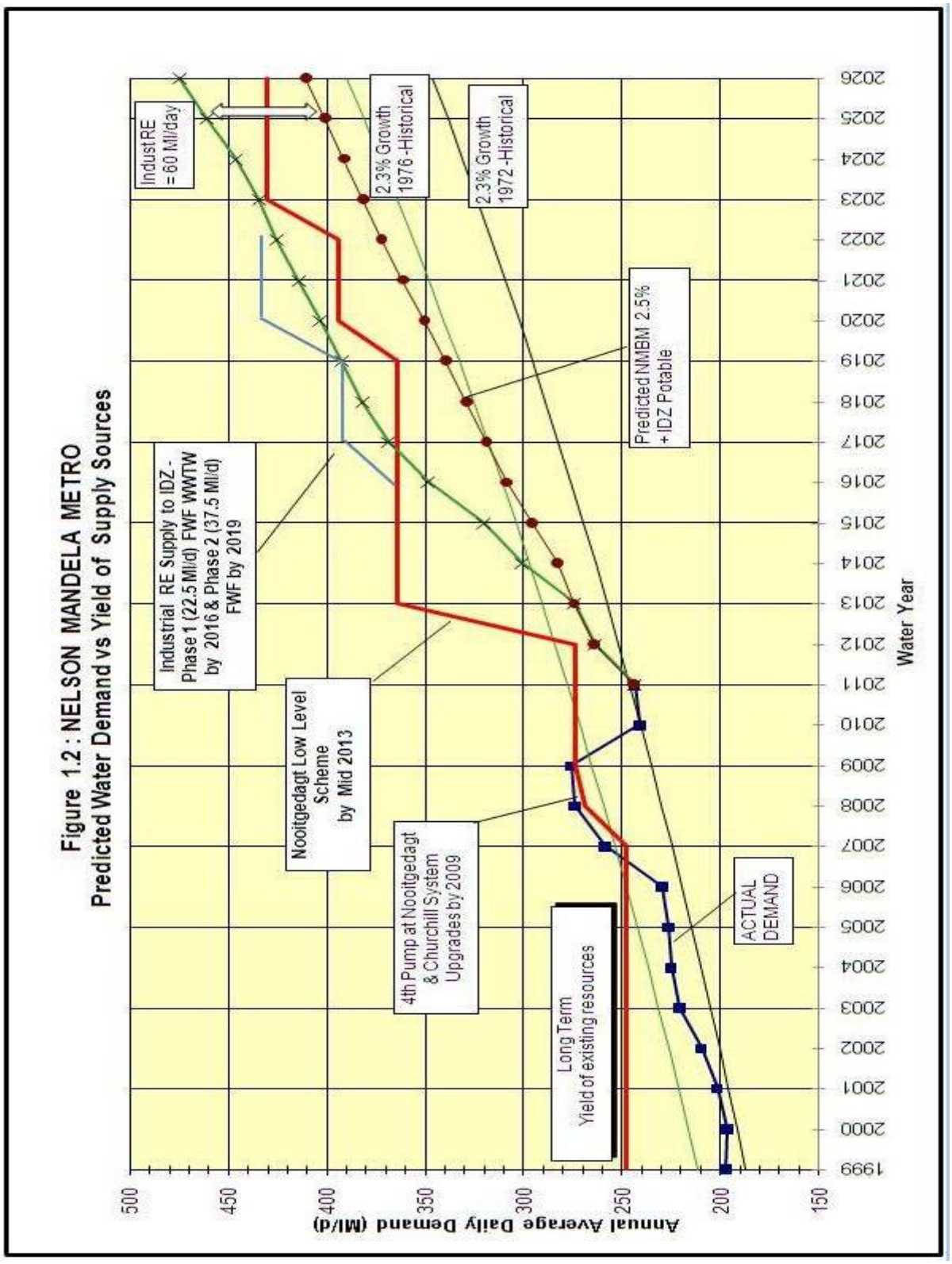


Figure 1.2 : NELSON MANDELA METRO
Predicted Water Demand vs Yield of Supply Sources
Annual Average Daily Demand (Ml/d)
Water Year
Industrial RE Supply to IDZ - Phase 1 (22.5 Ml/d) FWF WWTW by 2016 & Phase 2 (37.5 Ml/d) FWF by 2019
Industrial RE = 60 Ml/day
2.3% Growth 1976 -Historical
2.3% Growth 1972 -Historical
Predicted NMBM 2.5% + IDZ Potable
Nooitgedagt Low Level Scheme by Mid 2013
4th Pump at Nooitgedagt & Churchill System Upgrades by 2009
Long Term Yield of existing resources
ACTUAL DEMAND

4. RECOMMENDATION

That,

(a) whilst the NMBM and the CDC are sourcing funding for the RE supply scheme to provide the Coega IDZ with Phase 1 industrial water supply, and
(b) whilst the project planning and design for the project will take some 2 years to complete before construction may commence, and
(c) whilst surplus potable water will be available from the NCLLS for some 2-4 years,

the ROD condition for industrial water to be sourced from return sewerage effluent sources, be amended to allow for the interim use of potable water as an industrial water supply to Coega IDZ.