INTEGRATED WATER USE LICENCE APPLICATION
in terms of sections 27 to 31 of the National Water Act, 1998 (Act No. 36 of 1998)

Project Title:

Integrated Water Use Licence Application for an existing irrigation dam on Portion 2 of the farm Waterfall 996 JT.

Application for:

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Table 1. Document Control.

COMPILED BY	STATUS	REVISION	SIGNATURE	DISTRIBUTED ON
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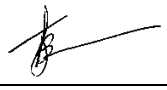
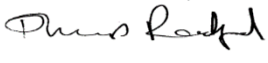
Justin Bowers	Draft	01		29 May 2018
Phil Radford	Final	00		14 November 2018

1. Need & Desirability (Motivation Section 27)

"27. *(1) In issuing a general authorisation or licence a responsible authority must take into account all relevant factors, including –*

(a) existing lawful water uses;

Farm Waterfall was allocated 567,600 cubic meters water per annum for section 21(a) "taking of water for irrigation purposes" confirmed through a formal declaration of Existing Water Use issued by the Inkomati-Usuthu Catchment Management Agency (IUCMA) under section 33(2) of the NWA – undated as well as the "certificate of rateable area" issued by the Noord-Kaap River Irrigation Board.

(b) the need to redress the results of past racial and gender discrimination;

Greyvan Investments (Pty) Ltd actively contributes to redressing past racial and gender discrimination through their employment base which encompasses at various levels of management, several race groups of both genders and is a significant employer in the area (See tables 4 & 5 below – Workforce Profile).

Nationally the agriculture sector provides employment for a million people and agro-industrial activity amounts to about 15% of GDP and 8% of South Africa's foreign exchange earnings (South Africa at a Glance, Mpumalanga Province, 15th Edition, 2009-2010, Mpumalanga Economic Growth Agency). Similarly, agriculture provides jobs far more than their contributions to the Provincial GGP – the sector comprises 6.1% of total GGP yet provides 18.1% of the employment opportunities in Mpumalanga.

Greyvan Investments further make use of various sub-contractors to undertake several activities on the properties including but not limited to steelwork, plumbing and construction, many of whom are previously disadvantaged.

Table 4. Workforce profile of Greyvan Investments (Pty) Ltd.

Occupational Levels	Male				Female				Foreign Nationals		Total
	A	C	I	W	A	C	I	W	Male	Female	
Top management	0	0	0	1	0	0	0	0	0	0	1
Senior management	0	0	0	5	0	0	0	0	0	0	5
Professionally qualified and experienced specialists and mid-management	2	0	0	0	0	0	0	1	0	0	3
Skilled technical and academically qualified workers, junior management, supervisors, foremen and superintendents	7	0	0	1	1	0	0	3	16	1	29
Semi-skilled and discretionary decision making	12	0	0	0	1	0	0	0	32	1	46
Unskilled and defined decision making	7	0	0	0	23	0	0	0	144	50	224
TOTAL PERMANENT	28	0	0	7	25	0	0	4	192	52	308
TEMPORARY EMPLOYEES	11	0	0	0	16	0	0	0	0	0	27
GRAND TOTAL	**39**	**0**	**0**	**7**	**41**	**0**	**0**	**4**	**192**	**52**	**335**

Table 5. Disabled workforce profile of Greyvan Investments (Pty) Ltd.

Occupational Levels	Male				Female				Foreign Nationals		Total
	A	C	I	W	A	C	I	W	Male	Female	
Top management	0	0	0	0	0	0	0	0	0	0	0
Senior management	0	0	0	0	0	0	0	0	0	0	0
Professionally qualified and experienced specialists and mid-management	0	0	0	0	0	0	0	0	0	0	0
Skilled technical and academically qualified workers, junior management, supervisors, foremen and superintendents	0	0	0	0	0	0	0	0	1	0	1
Semi-skilled and discretionary decision-making	0	0	0	0	0	0	0	0	1	0	1
Unskilled and defined decision making	0	0	0	0	0	0	0	0	2	0	2
TOTAL PERMANENT	0	0	0	0	0	0	0	0	4	0	4
TEMPORARY EMPLOYEES	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**

(c) efficient and beneficial use of water in the public interest;

Greyvan Investments (Pty) Ltd utilise micro sprayers to irrigate their Macadamia trees, reducing wasteful over-application and associated runoff. The water stored in the dam will be abstracted from the perennial Noordkaap River and as such does not place undue water stress on the ephemeral stream in which the dam is located. Greyvan utilises soil probes at several locations within their macadamia orchards to ensure efficient use of water and no over-irrigation takes place. The use of soil probes ensures that at times of high soil moisture content resulting from high precipitation, irrigation will not be needed, and the irrigation water not utilised would be available for the system and downstream users.

As the dam will be located within a non-perennial stream it will only receive runoff during rainfall events and the return flows from the irrigated orchards, and water levels will be largely maintained by pumped water out of the Noorkaap River hence, the dam will not significantly affect the availability of water to downstream users in the Noorkaap River, by impounding water even when not in use.

The development of a sustainable water supply system at Greyvan conforms to section 7.1.3 of The National Water Resource Strategy (NWRS, June 2013 – 2nd edition) that addresses irrigation, the relevant excerpts inserted below to demonstrate how the proposed project plans to align with the NWRS:

"The agricultural sector accounts for approximately 60% of water utilisation in South Africa. Water conservation and water demand management must thus become entrenched in the agriculture sector.
• Many irrigation agricultural schemes experience water losses of between 35% and 45%.
• The efforts to save water by this sector should be given high priority. A small percentage improvement in water use efficiency could result in a substantial reduction in water losses. In terms of water delivered on farms, all efforts must be made to use water efficiently from on farm storage, distribution systems, and in-field application supported by best management practices.
• The greatest potential impact of water conservation and water demand management (WCWDM) in the agricultural sector can be achieved by addressing wastage from conveyance losses and the inefficient application of water. Water wastage is classified as water, intended to perform a specific task, but not used for that purpose due to losses in transit. Examples of water wastage in the agricultural sector are seepage from irrigation canals (which causes water logging of adjacent land), loss because of percolation, evaporation from land surfaces, or polluted return flows.
• Employing efficient irrigation systems is paramount in improving water use efficiency on farms, such as drip irrigation or, when managed and operated effectively, results in significant improvements in water use efficiency.
• Improve scheduling of irrigation through the use of soil moisture content monitoring instruments (probes and wetting front detectors)."

(d) the socio-economic impact -

(i) of the water use or uses if authorised; or

Greyvan Investments has approximately 350 hectares under active agriculture for which they utilise their current irrigation rights to service. To help ensure tree health and tree production potential, regular and adequate water provision is essential. Realising consistent yields year on year, ensures the financial sustainability of the enterprise along with job security and economic benefits to local businesses, especially those providing direct services to Greyvan Investments.

A significant constraint to ensuring an adequate water supply to existing crops, is the intermittent and seasonal inability of the Noordkaap River to match demand. This supply shortfall results from existing abstraction upstream in the Noordkaap River, not the least of which is afforestation, especially over low/non rainfall conditions. The ability to store water will help ensure that adequate water is available on demand and at the same time reduce the demand on the river over flow-constrained periods. Future potential conversion to drip irrigation will further reduce water requirements and minimise losses.

The ongoing profitability of the farming enterprise will ensure long-term job security to the workforce and potentially provide for additional job creation as production output increases.

The following extract off the website of the South African Macadamia Grower's Association (SAMAC) (www.samac.org.za) provides an overview and provides context to the growing importance of macadamia production as an agricultural product, employment provider and economic driver for South Africa.

"From fairly humble beginnings in the 1960's when macadamias were first introduced into the country, the South African macadamia industry has grown into a major world force, competing with Australia in terms of being the largest producer. It is arguably the fastest growing tree crop industry in South Africa with production increasing more than 20-fold in the last 20 years, from 1 211 tons of nut in shell (NIS) in 1991 to about 46 000 tons in 2015. The total sales value of annual production has increased from R32 million in 1996 to over R 4 Billion in 2015. New macadamia tree plantings have increased the number of trees from about one million in 1996 to more than 7.5 million in 2016, covering a total area of approximately 25 000 hectares. New plantings ensure that the industry is growing by an estimated 2 000 ha annually.
The main growing areas are Levubu and Tzaneen in Limpopo province, Hazyview to Barberton in Mpumalanga and coastal KwaZulu-Natal.
The industry is export based with more than 95% of annual production shipped to international markets. Approximately 50% of the South African crop is exported as NIS to Asia, and the remainder of the crop is processed to kernel. The USA and Canada is the largest market for kernel exports. Other markets include Europe, Japan, Southeast Asia and the Middle East. Given the large number of young trees yet to come into production, the industry has tremendous growth and development potential. Although most of the workforce in the industry is employed seasonally, for the harvesting and processing from February to August, it is estimated that at least 7 150 permanent job opportunities have been created on macadamia farms and another 600 permanent jobs in cracking facilities. In peak season, the industry presently provides employment for an additional 8 150 workers. A total of 12 500 full-time equivalent workers are estimated to be employed by the macadamia industry in South Africa. Since production is expected to continue to increase due to the rate at which new plantings are being

established, employment creation is expected to continue to grow at a similar pace (Updated: 17 October 2016").

Furthermore, the National Water Resource Strategy (June 2013 – 2nd edition) states: The agricultural sector "*supports a significant portion of the South African economy and contributes massively to rural development. It assures food security for the country and contributes to job creation and employment throughout the food production value chain."*

The National Water Act (NWA, Act No. 36 of 1998, Section 3) requires that the Reserve be determined for rivers, i.e. the quantity, quality and reliability of water needed to sustain both human use and aquatic ecosystems, so as to meet the requirements for economic development without seriously impacting on the long-term integrity of ecosystems (DWAF, 2008). This includes the generation of a social-cultural index (SCI) for each quaternary catchment.

The SCI was generated by scoring each quaternary of the Crocodile River catchments based on the following features (all scored between 0 -5.):

- Ritual Use: The question that was asked was "How much ritual use of the river takes place?"
- Aesthetic Value: The question that was asked was "How important is the aesthetic value to people? Does the river stretch add value to people lives as an object of natural beauty? Would changing flows detract from this value?"
- Resource Dependence: This refers to the goods and services delivered by the river system and people's dependence on these components.
- Recreational Use: The question that was asked was "Does the river stretch provide recreational facilities to people and would this be affected by changing flows".
- Historical/Cultural Value: The question that was asked was "Does the river have a strong cultural or historical value?"

The final scores were then combined to generate an overall score between 0 and 5. The meaning of the score is as set out in Table 6 below (DWAF, 2008). The SCI value for the X23 catchment calculates "Minimal" as seen in Figure 2.

Table 6: SCI rating.

0-0.99	Minimal	Of little or no socio-cultural importance.
1-1.99	Low	Of some importance. PES not critical, but caution should be displayed with regard to negative impact on dependent communities.
2-2.99	Moderate	Of moderate importance. PES should not be allowed to be negative affected without strong motivation.
3-3.99	High	Of high importance. A score in this range motivates for maintain or potentially positive change to PES.
4-5	Very High	Of extreme importance. A score in this range motivates for the change to PES

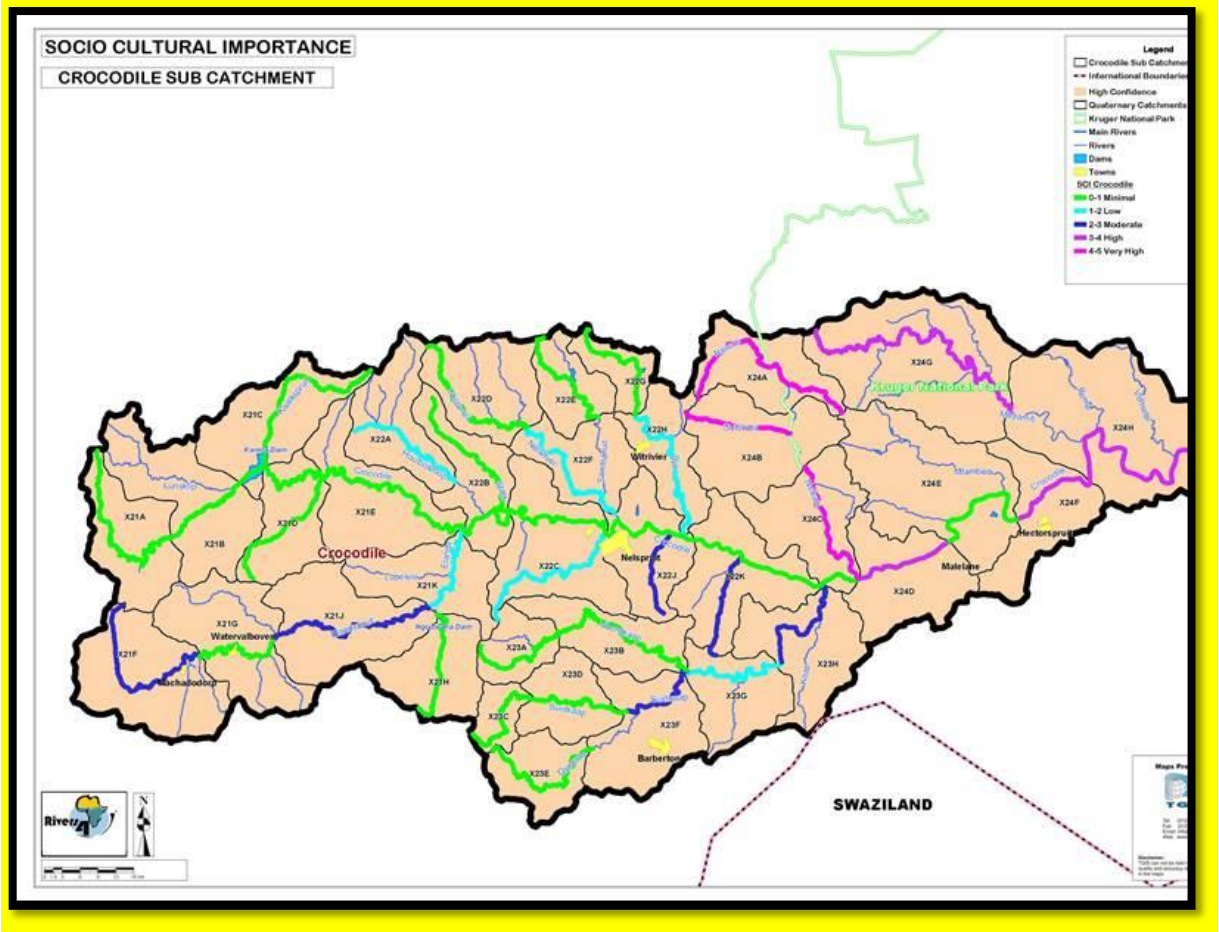


Figure 2: Crocodile Sub-catchment: SCI map illustrating SCI rating and confidence (DWAF, 2008).

(ii) of the failure to authorise the water use or uses;

Section 21(a) water use entitlement has already been issued in terms of Existing Lawful Use, and the dam will simply provide a suitable storage vessel within an existing drainage line. The lack of authorisation of the dam will place the long-term sustainability of the farming enterprise in jeopardy, including the risk to employment, local economy, provincial GGP and export revenues.

The restriction to the sustainability of this agricultural activity is due to output production of Macadamia Farms being strongly linked to water stress which often limits tree growth, as well as the set, growth and quality of macadamia nuts (www.nda.agric.za/docs/Infopaks/macadamia.htm.) The current production levels cannot be sustained by dryland agriculture alone. The table below indicates the water requirement for 5 & 10-year old trees throughout the year, including the winter months when rainfall is absent in the Lowveld area.

Table 7. The approximate water requirements for macadamia trees (mm/month) (www.nda.agric.za/docs/Infopaks/macadamia.htm.).

Tree age	
Years	Month

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Apr.	May	Jun.	Jul
5	16	20	24	27	29	29	24	21	14	9	9	9
10	46	57	69	77	81	81	67	59	38	26	26	26

(e) any catchment management strategy applicable to the relevant water resource;

Two levels of strategic planning for water resources exist: The National Water Resource Strategy (NWRS) and the Catchment Management Strategies (DWAF, 2007). Essentially, The National Water Resource Strategy (NWRS) provides the basis for the Catchment Management Strategies (CMS) and is thus a key source document for the Catchment Management Agencies (CMAs). Undoubtedly, more detailed and updated information will go into each CMS.

The Inkomati-Usuthu Catchment Management Agency (IUCMA) has generated an Integrated Catchment Management Strategy (CMS) -Status Quo Report: Final Draft (dated March 2008).

The Executive Summary of the CMS states that "the key outcome of a catchment management strategy is the protection, use, development, conservation, management and control of water resources within a water management area".

The foreword of the CMS further states that, the report highlights some key challenges facing the nation's water resources which need to be addressed by ensuring they are used, developed, conserved, managed, controlled and protected in ways which take into account the following:

a) Meeting the basic human needs of present and future generations;
b) Promoting the equitable access to water;
c) Redressing the racial and gender discrimination associated with apartheid legacy;
d) Promoting the efficient, sustainable and beneficial use of water in the public interest;
e) Providing for growing demand for water use;
f) Protecting aquatic and associated ecosystems and their biological diversity;
g) Reducing and preventing pollution and degradation of water resources;
h) Meeting international obligations;
i) Promoting dam safety; and
j) Managing floods and droughts.

The declaration of the section 21(a) water use as Existing Lawful Use was assumedly issued in light of the CMA strategy. The other section 21 water uses will also be arbitrated in light of this strategy including the above-mentioned factors, assisting the IUCMA to meet the objectives of the CMS.

The Kaap River catchment is a major tributary of the Crocodile River. There are no major dams in the Kaap River catchment but there are several farm dams. The Kaap River rises on the escarpment and drops off steeply to a wide valley floor. Land-use in this Integrated Units of Analysis (IUA) consists of forestry, grazing and irrigation. The water requirements of Barberton are supplied from the Komati catchment.

The upper Kaap system is covered with forestry which is the main influence on the rivers in the upper catchments. In the lower streams (Kaap and Suidkaap) dams increase and the main influences on these lower reaches are abstraction for irrigation with associated return flows that impact on the water quality of these systems.

The National Water Resource Strategy (June 2013 – 2nd edition) discusses international cooperation and trans-boundary water course management and outlines how South Africa should ensure that Integrated Water Resources Management (IWRM) is implemented in a manner that conforms to international water protocols and treaties while being compliant with the legislation governing water resource management in SA.

Approximately 60% of the streamflow in rivers in or on the borders of South Africa water is shared through trans-boundary water systems. Hence, water use must also be contextualised within national and international context.

South Africa is a signatory to the SADC Revised Protocol on Shared Water Courses; it thus has an obligation to fulfil its commitments through cooperation with its neighbours in the management of international waters in the interest of regional economic integration, peace and security. South Africa shares four major rivers systems with six neighbouring countries:
• Orange/Senqu system shared with Lesotho, Botswana and Namibia • Limpopo system shared with Botswana, Zimbabwe and Mozambique,
• Inkomati system shared with Swaziland and Mozambique,
• Usuthu/Pongola – Maputo system shared with Mozambique and Swaziland.

This overall objective can only be achieved through the establishment of shared watercourse institutions or River Basin Organisations (RBO). Shared watercourse institutions can be established as a River Basin Commission, Joint Water Commission, Technical Committee or Joint Water Authority.

However, the establishment of a shared watercourse institution is guided by a series of general principles of customary law.

The most prominent are:

- Equitable and reasonable utilisation: shared watercourse shall be used and developed by watercourse states with a view to attain optimal and sustainable utilisation.
- Prevention of significant harm: shared watercourse states shall, in utilising a shared watercourse in their territories, take all appropriate measures to prevent causing significant harm to other watercourse states, and take all necessary measures to eliminate or mitigate such harm as may occur.
- Prior notification: before a shared watercourse state implements a planned measure that may have an adverse effect upon other watercourse states, it shall provide those states with timely notification.

A RBO is under consideration for the Inkomati River and the outcome of the investigation is captured in the document "*Comprehensive Legal and Institutional Analysis for the Incomati and Maputo River*

Basins - Proposal for the Establishment of an RBO for the Incomati and Maputo River Basins, September 2011". The Incomati and Maputo Rivers are shared by South Africa, Swaziland and Mozambique.

None of the water uses applied for will infringe on the fulfilment of the above-stated principles.

(f) the likely effect of the water use to be authorised on the water resource and on other water users;

The IUCMA Catchment Management Strategy states that the Ecological Reserve and Basic Human Needs Reserve(BHNR) have not officially been established for the greater part of the Inkomati-Usuthu Water Management Area (IWMA) (section 3.10.3). Section 3.10.3 further claims that DWAF in a publication dated in 2007 lists several river stretches of concern in terms of various impacts on ecological integrity, of which the Noordkaap is not listed, while the Suidkaap is.

Storing or diverting water via impoundments or weirs alter the natural distribution and timing of stream flow. The following in-stream flow impacts are typical (quantity, pattern, timing, water level and assurance):

- Disruption of longitudinal and lateral connectivity;
- Changes in temporal and spatial characteristics of flow can have an impact on habitat attributes such as an increase in duration of low flow season, resulting in low availability of certain habitat types or water at the start of the breeding, flowering or growing season.
- Implicates flow, bed, channel and water quality characteristics (Deacon, May 2018).

The project drainage line is an unnamed seasonal tributary within the Noordkaap River System. Although there was some seeping flow during the survey period (April 2018), it seems that the little stream will only have substantial flows after good downpours during the rainy season. It is therefore anticipated that although there might be some surface flows during high-flow season, during the low flow season, most of the flows are subsurface and the impacts listed above will be nominal.

Changes in temporal and spatial characteristics of flow can have an impact on habitat attributes such as an increase in duration of low flow season, resulting in low availability of certain habitat types or water at the start of the breeding, flowering or growing season.

The above factors mitigate the impacts of the dam on the watercourse, including the Noordkaap River.

(g) the class and the resource quality objectives of the water resource;

The National Water Act (No. 36 of 1998) (NWA) sets out to ensure that water resources are used, managed and controlled in such a way that they benefit all users. In order to achieve this, the Act prescribes a series of measures which are intended to ensure comprehensive protection of water resources so that they can be used sustainably. The Act states that these measures are to be developed progressively within the context of the National Water Resource Strategy and catchment management strategies. In particular the Act provides for:

- The development of a Classification System for water resources
- The setting of a Management Class and Resource Quality Objectives

- Determination of the Reserve

Resource Quality Objectives capture the Management Class of the Classification System and the ecological needs determined in the Reserve into measurable management goals that give direction to resource managers as to how the resource needs to be managed.
The National Water Act states that the purpose of RQOs is to establish clear goals relating to the quality of the relevant water resources and stipulates that in determining RQOs a balance must be sought between the need to protect and sustain water resources and the need to use them (Chapter 3 part 2). The Act further states that the RQOs may "relate to the Reserve; the instream flow; the water level; the presence and concentration of particular substances in the water; the characteristics and quality of the water resource and the instream and riparian habitat; the characteristics and distribution of aquatic biota; the regulation or prohibition of instream or land-based activities which may affect the quantity and quality of the water resource; and any other characteristic". The Act also states that "once the Class of a water resource and the Resource Quality Objectives have been determined they are binding on all authorities and institutions when exercising any power or performing any duty under this Act."
As there are significant overlap in the RQO steps with the Classification and Reserve steps, integrated steps have been designed which incorporates the RQO steps in an iterative manner and used during this study. The 7 steps are incorporated in the integrated steps and this integration is illustrated in Table 8.

Table 8. RQO steps as integrated in the Integrated Classification Steps.

Integrated steps		RQO steps	Comment
1	Delineate the units of analysis and Resource Units (RUs), and describe the status quo of the water resource(s) (completed).	1. Delineate IUAs and define RUs	RUs are defined at a broad level on a sub-quaternary basis.
		3. Prioritize and select RUs for RQO determination	Process to determine priority areas called hotspots defines the priority levels for RQO determination
2	Initiation of stakeholder process and catchment visioning (on-going).	2. Establish a vision for the catchment and key elements for the IUAs	Undertaken during Step 1 above.
3	Quantify the Ecological Water Requirements and changes in non-water quality ecosystem.	3. Prioritize and selected RUs for RQO determination	More detailed RUs defined for high priority rivers.
		4Prioritise sub-components for RQO determination, select indicators for monitoring and propose direction of change	Undertaken during Step 1 and 3 as part of the EcoClassification process.
4	Identification and evaluate scenarios within the Integrated Water Resource Management process.		

Integrated steps		RQO steps	Comment
5	Evaluate the scenarios with stakeholders and determine Management Classes.	6. Agree RUs, RQOs and numerical limits with stakeholders	Is undertaken during all preceding stakeholder meetings. RQOs (hydrological) are agreed during the MC decision making as the hydrological RQOs are the flows associated with the MC
6	Develop draft RQOs and numerical limits.	5. Develop draft RQOs and numerical limits	The focus in this step is on finalising the habitat, biota and water quality RQOs.
7	Gazette and implement the class configuration and RQOs.	7. Finalise and gazette RQOs	

Site Level EcoClassification and the Present Ecological State

The purpose of EcoClassification is to gain insight into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the river.
The state of the river is expressed in terms of biophysical components:

- Drivers (physico-chemical, geomorphology, hydrology), which provide a particular habitat template; and
- Biological responses (fish, riparian vegetation, riverine fauna (other than fish) and aquatic invertebrates).

Due to the fact that the Greyvan Project area drainage is not a significant tributary, it was not addressed by the Department of Water and Sanitation Desktop PESEIS assessment. For this reason, alternative ways of obtaining the PES will be used. To facilitate that, a similar model that was used in the Department of Water and Sanitation Desktop PESEIS assessment, was used to obtain the PES of the Greyvan Project area. Table 8 summarises the parameters that is used to obtain the PES and the result of the process.

Table 9. A summary of the parameters that is used to obtain the PES and the result of the process for the Greyvan Project drainage line.

Parameters	Potential modification (see list of ratings below)	Agent of modification	Calculated modification in the Noord Kaap River (PESEIS study, 2015)
In-stream habitat continuity modification	**2**	Roads, agriculture, forestry.	**1**
Riparian/Wetland zone continuity modification	**2.5**	Roads, agriculture, forestry.	**3**
Potential in-stream	**3**	Roads, sedimentation,	**3**

habitat modification		alien invasive plants.	
Riparian/Wetland zone modification	**2.5**	Agriculture, forestry.	**3**
Potential flow modification	**1.5**	Forestry.	**2**
Potential physico-chemical modification	**1**	Sediment input.	**3**
In-stream PES	**C (1.8)**		**D (2.5)**
Riparian PES	**D (2.5)**		**D (3.0)**
PES Overall	**C (2.0)**		**D (3.0)**
	Moderate modified		Largely modified

According to Table 9, PES of the Greyvan Project drainage line is a Class C (In-stream PES 1.8; and Riparian PES 2.5), mostly influenced by roads, agriculture, forestry. The calculated modification in the Noord Kaap River equates a Class C (In-stream PES 2.5; and Riparian PES 3.0), with large modifications due to agricultural fields, bed and channel disturbances and vegetation removal.
Interpretation of Impact Ratings (referred by in Table 8 as Potential modification):

- **None.** Reference. No discernible impact, or the modification is located in such a way that it has no impact on habitat quality, diversity, size and variability. **Rating = 0.**
- **Small.** The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability are also very small. **Rating = 1.**
- **Moderate.** The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability are also limited. **Rating = 2.**
- **Large.** The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are, however, not influenced. **Rating= 3.**
- **Serious.** The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area are affected. Only small areas are not influenced. **Rating = 4.**
- **Critical.** The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally. **Rating = 5.**

Existing land and water use impacts (and threats) on the characteristics of the watercourse

IUA X2-10: Resource Quality Objectives

The IUA overview and description is provided below.
This IUA consists of the Kaap River catchment, a major tributary of the Crocodile River. There are no major dams in the Kaap River catchment but there are several farm dams. The Kaap River rises on the escarpment and drops off steeply to a wide valley floor. Land-use in this IUA consists of forestry,

grazing and irrigation. Water use in this IUA consists of irrigation and limited gold mining. The water requirements of Barberton are supplied from the Komati catchment.

The upper Kaap system is covered with forestry which is the main influence on the rivers in the upper catchments. In the lower streams (Kaap and Suidkaap) dams increase and the main influences on these lower reaches are abstraction for irrigation with associated return flows that impact on the water quality of these systems.

IUA X2-10 is depicted in Figure 3 and the associated priority rating of the biophysical nodes are provided in Table. 9 below.

Figure 3: IUA X2-10 - Kaap River system.

Table 10. Priority ratings.

RUs	SQ number	River	PES	REC	RU PR
RU C16	X23B-01052	Noordkaap	**D**	**C**	**3WQ 2**
RU C17	X23C-01098	Suidkaap	**C**	**B/C**	**3WQ**
	X23E-01154	Queens	**C**	**B/C**	
	X23F-01120	Suidkaap	**C**	**C**	
Kaap A	X23G-01057 EWR C7	Kaap	**D**	**B**	**3 3WQ**

RQOs for RU C16: High priority - 3 for water quality and moderate for biota and habitat (X23b-01052). X23B-01052 requires improvement to achieve the TEC. Improvement of riparian zone integrity

(forestry and agriculture) is needed to achieve the REC as well as improvement in water quality from mining.

A summary of the flow RQOs are provided below in Table 10.

Table 11. RU C16: Flow RQOs.

REC (EWR)	nMAR (MCM)	pMAR (MCM)	Low flows (MCM)	Low flows (%nMAR)	Total flows (MCM)	Total (%nMAR)	Oct		Feb	
							90%	70%	90%	70%
X23B-01052										
C[1]	50.91	33.51	13.68	26.9	17.503	34.4	0.212	0.246	0.253	0.396

1 The EWR rule is provided for a D as the improvements to a C are based on non-flow related measures.

Water quality RQOs

Users: Irrigation returns flows.

Water quality issue: Elevated nutrients and salts, turbidity.

Narrative and numerical details for RU C16 are provided in Table 11 below.

Table 12. RU C16: Narrative and numerical water quality RQOs.

Narrative RQO	Numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to 30 mS/m (Aquatic ecosystems: driver).
Ensure that turbidity/clarity or TSS levels stay within Acceptable limits.	A moderate change from present with temporary high sediment loads and turbidity (aquatic ecosystems: driver).

Habitat and Biota RQOs (EcoSpecs)

Habitat and biota RQOs are provided in Table 12 below.

Table 13. RU C16: Narrative and numerical habitat and biota RQOs.

Indicators	Narrative RQO	Numerical RQO
RIPARIAN VEGETATION		
Dominant vegetation cover	The dominant vegetation cover should remain woody (trees and shrubs) with	N/A.

Indicators	Narrative RQO	Numerical RQO
	some areas dominated by grasses.	
Presence of alien plant species in the riparian zone	The extent of perennial alien plant species within the riparian zone should remain moderate or decrease.	
Riparian zone continuity	Riparian zone continuity should remain moderately modified, or improve.	
Riparian zone fragmentation	Riparian zone fragmentation should not increase (from its 2014 state). There should be no expansion of agricultural or forestry activities into the riparian zone and existing agriculture or forestry should not expand or intensify towards or within the riparian zone.	
Plant endemism	Levels of riparian plant endemism determined during the PES 2011 project (DWS, 2014b) should be maintained.	Seven endemic riparian plant species should remain present within the RU (refer to DWS (2014b) for species list).
Threatened riparian species	Viable populations of riparian plant species with IUCN status should remain within the RU.	Three listed riparian species should remain within the RU (*C. macowanii*, *Ilex mitis* var. *mitis* and *Syzygium pondoense*).
Taxon richness	Maintain riparian taxon richness within the RU.	Maintain the presence of at least 80 riparian plant taxa within the RU.

Several water resource objectives derived from the IUCMA Resource Quality Objectives (RQO, GG No. 40531, GN No. 1616, 30 December 2016) for the Noordkaap River, and henceforth applied to the tributary in which the Waterfall Dam is located are listed below and contextualised for the application at hand. Table 13 shows that the Noorkaap River, from which the water stored in the Waterfall Dam is abstracted, is a Class II River, requiring moderate protection and moderate utilisation. The target Ecological Category (EC) is a "C" also indicating "moderately modified".

Table 14. Classes of water resources and resource quality objectives for the catchments of the Inkomati.

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
X2-10 Kaap Catchment	II	X23B-01052	Noordkaap	C

Table 15 below gives greater insight into the EC for attributes of the aquatic environment.

Table 15. Generic numerical and narrative RQOs associated with Ecological Categories.

Ecological Category	Generic Narrative RQO	Instream and riparian habitat narrative RQO	River Name	Numerical RQO
C	Moderately modified.	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	Assemblage attributes as specified.	≥ C (≥ 62%)

Hence, any water use within this sub-catchment must conform to these set objectives.

The Executive Summary of the IUCMA Catchment Management Strategy states that the greatest threat to water quality within the river systems is sewage related pollution. The water use application at hand only deals with raw water and as such is unlikely to affect water quality of either the ephemeral tributary or the Noordkaap itself. A risk of pollution is possible due to over irrigating with consequential leaching of inorganic fertiliser and other soil nutrients, but due to the micro-spray irrigation system in place, this risk is very low.

"Although water quality would appear to currently be fit for the purpose for which it is intended to be used, there is a concerning trend of declining quality and an increase in the threat of potential pollution activity. The nutrients' concentrations in the rivers are increasing steadily. The Electrical Conductivity is also increasing in all rivers in the IWMA. Whilst a monitoring system is in place, technical committees need to be set up in all sub-catchments to aid in the monitoring of the water quality as in the Crocodile Catchment. Areas of water quality concern are the Kaap River and the lower reaches of the Crocodile River, with poor water quality becoming a problem to water users in the lower part of the catchment. The worst form of pollution that is almost a constant feature in all rivers in the IWMA is sewage pollution. A health problem is envisaged if this problem is not controlled as soon as possible" (IWMA, 2008).

It is likely that the water use applications at hand will conform to the set CMS objectives and result in a deterioration to the resource quality, as long as abstraction is metered and complies with the quantity stipulated in the ELU, irrigation is regulated to ensure no ever-wetting, and in so doing minimises leaching of fertilisers.

Table 16 below summarises the key hydrological RQOs for the X23G biophysical node that is downstream of the X23B node.

Table 16. Rivers: Summary of key hydrological RQOs of the Crocodile River System (X2).

RU	Biophysical node	River	Target EC	nMar[1] (MCM)	Low flows (%nMAR)[2]	Total flows (%nMAR)	Months	RQO[3] (m3/s)	
								90%	60%
IUA X2-10									
MRU Kaap A	X23G-01057 EWR C7	Kaap	C	179.5	16.38	21.84	Oct	0.19	0.45
							Nov	0.32	0.67
							Dec	0.47	0.89
							Jan	0.61	1.12
							Feb	0.86	1.53
							Mar	0.84	1.49
							Apr	0.82	1.42
							May	0.68	1.24
							Jun	0.61	1.13
							Jul	0.47	0.89
							Aug	0.29	0.62
							Sep	0.17	0.44

Legend:

[1] nMAR is the natural Mean Annual Runoff in million cubic meters per annum.

[2] %nMAR is flow required at the nodes expressed as a percentage of the natural Mean Annual Runoff, Low flows and Total flows.

[3] Percentage points on the monthly low frequency distribution continuum at the nodes, expressed as the percentage of the months (90% and 60%) that the flow should equal or exceed the indicated minimum values.

The current authorised abstraction volumes stipulated in the ELU declaration need to be metered and enforced to help ensure that the target hydrological RQOs are achieved.

Table 17 below provides habitat and biota RQOs for the Kaap River for the X2-10 IUA, in which the X23B quaternary catchment is located. Most values fall within an EC of "C" except for geomorphology which is a "B" (largely natural with few modifications) and riparian vegetation is a "C/D" (moderately to largely modified).

Table 17. Habitat and biota RWOs for Rivers.

IUA	Resource Unit (Biophysical node) (River)	Instream Habitat Integrity	Riparian Habitat Integrity	Geomorphology	Fish	Macro-invertebrates	Riparian vegetation
IUA X2-10	MRU KAAP A (EWR C7) (Kaap River)	C	C	B	C	B	C/D

Table 18 quantifies the RQOs for Rivers for water quality (ecological and user) in priority Resource Units of the CROCODILE RIVER System (X2) depicted in Figure 6.

Table 18. RQOs for Rivers for water quality (ecological and user) in priority Resource Units of the CROCODILE RIVER System (X2).

IUA	RU	Target EC	Sub-Component	Narrative RQO	Numerical RQO
IUA X2-10	MRU KAAP A (EWR C7) (Kaap River)	B	Nutrients (phosphate and Total Inorganic Nitrogen)	Tolerable	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
					50th percentile of the data must be < 4.0 mg/L TIN-N (aquatic ecosystems: driver).
			Electrical Conductivity (salts)	Acceptable	95th percentile of the data must be within the TWQR for toxins (1996a) or the upper limit of the A category in DWAF (2000).
			Toxins	Ideal	95th percentile of the data must be within the TWQR for toxins (1996a) or the upper limit of the A category in DWAF (2008).
				Ideal	As levels: 95th percentile of the data must be less than 0.020 mg/L As (aquatic ecosystems: driver).
				Ideal	Cn (free) levels: 95th percentile of the data must be less than 0.004 mg/L Cn (aquatic ecosystems: driver).

Legend:

TWQR = Target Water Quality Range (DWAF, 1996a).
CEV = Chronic Effects Value (DWAF, 1996a).
DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems.

Table 16 of the IUCMA Resource Quality Objectives list water quality RQOs in priority Resource Units, of which the Kaap River is not listed.

Figure 4. Crocodile (X2) catchment IUAs and Biophysical Nodes.

(h) investments already made and to be made by the water user in respect of the water use in question;

The dam is an existing dam and as such capital has already been spent on its construction and associated infrastructure, including pump houses, pumps and irrigation systems.

(i) the strategic importance of the water use to be authorised;

Strategic water use in terms of section 6(1)(b)(iv) of the NWA, needs to form part of the contents of national water resource strategy. NWRS2 makes provision for the allocation of water for strategic use and lists two key areas that will be targeted for this purpose. Strategic water use is particularly important to the National Development Outcomes and the economy as a whole and includes:

- The transfer of water from one water management area to another,
- The continued availability of water to be used for electricity generation throughout the country.

Neither of these two national strategic water uses are applicable to this application, but the strategic importance as it relates to agriculture is discussed below.

Macadamia production in South Africa, the Mpumalanga province and more specifically the Barberton area is an important contributor to agricultural exports, job creation and national gross domestic product (GDP) as explained more fully in the extracts below from an article published by the Department of Agriculture, Forestry & Fisheries in 2012.

"Macadamia nuts are quickly becoming an important crop in South Africa and are possibly the fastest growing tree crop industry in the country. South Africa is the third largest macadamia nut producer in the world, after Australia (where they originated) and Hawaii. The nuts are a valuable food crop. The trees require a hot subtropical climate without much humidity. In South Africa, KwaZulu-Natal, Mpumalanga and Limpopo are ideal areas. Macadamias are now widely used in the confectionery, baking, ice cream and snack food industries. Macadamia oil's rich, cushiony skin feel and high oxidative stability make it especially suitable for heavy creams and sun care formulations. Medical research has shown that the consumption of macadamias may significantly lower the risk of heart disease.

Although most of the workforce in the industry is employed seasonally for harvesting and processing from February to August, it is estimated that at least 3 000 new job opportunities have been created on macadamia farms over the last decade and another 1 000 jobs in cracking facilities. In peak season, the industry presently provides employment for more than 4 500 farm workers and about 1 500 factory workers. Since production is expected to double within the next 5 to 7 years, employment creation will continue to grow at a similar pace.

In South Africa, macadamia nuts are mainly grown in three provinces: Limpopo (Tzaneen and Levubu), Mpumalanga (**Barberton**, Nelspruit and Hazyview), and on the north and south coast of KwaZulu Natal. There are close to 1 000 farmers involved in growing macadamia nuts that are supplied to 12 cracking factories.

Mpumalanga province accounted for 8 820 ha of macadamia nuts, followed by Limpopo with 5 105 ha, Kwazulu Natal with 2 859 ha, Eastern Cape with 400 ha and the other provinces cultivated 183 ha. In terms of number of trees planted, Mpumalanga has over 2 million, followed by Limpopo with over 1.5 million, Kwazulu Natal with approximately 694 000 and Eastern Cape with 150 000.

Given the large number of young trees yet to come into production, the industry has tremendous growth and development potential. Over 90% of the production (12% of world production) is exported annually. According to ITC Trademap during 2011, South African macadamia nuts export represented 36.78% of world macadamia nuts exports (Mpumalanga and Limpopo are the top exporters of macadamia nuts in South Africa) and it was ranked no 1. In second place was Australia followed by the Netherlands, Kenya, Guatemala and Hong Kong China."

(j) the quality of water in the water resource which may be required for the Reserve and for meeting international obligations; and

The specific Water Quality Objectives are specified in section (g) above, addressing the class and the resource quality objectives of the water resource.

The Executive Summary of the IUCMA Catchment Management Strategy states that the greatest threat to water quality within the river systems is sewage related pollution. The water use application at hand only deals with raw water and as such is unlikely to affect water quality of either the ephemeral tributary or the Noordkaap itself. A risk of pollution is possible due to over irrigating with consequential leaching of inorganic fertiliser and other soil nutrients, but due to the micro-spray irrigation system in place, this risk is very low.

"Although water quality would appear to currently be fit for the purpose for which it is intended to be used, there is a concerning trend of declining quality and an increase in the threat of potential pollution activity. The nutrients' concentrations in the rivers are increasing steadily. The Electrical Conductivity is also increasing in all rivers in the IWMA. Whilst a monitoring system is in place, technical committees need to be set up in all sub-catchments to aid in the monitoring of the water quality as in the Crocodile Catchment. Areas of water quality concern are the Kaap River and the lower reaches of the Crocodile River, with poor water quality becoming a problem to water users in the lower part of the catchment. The worst form of pollution that is almost a constant feature in all rivers in the IWMA is sewage pollution. A health problem is envisaged if this problem is not controlled as soon as possible" (IWMA, 2008).

The water uses being applied for do not include any discharge of waste water which might compromise the quality of water which may be required for the reserve and meeting international obligations.

The IUCMA Catchment Management Strategy states that the Ecological Reserve and Basic Human Needs Reserve(BHNR) have not officially been established for the greater part of the Inkomati-Usuthu Water Management Area (IWMA) (section 3.10.3). Section 3.10.3 further claims that DWAF in a publication dated in 2007 lists several river stretches of concern in terms of various impacts on ecological integrity, of which the Noordkaap is not listed, while the Suidkaap is.

The Governments of the Republic of Moçambique, the Republic of South Africa and the Kingdom of Swaziland have been collaborating in the exchange of information, agreements on sharing of water, and in joint studies that are of joint interest and benefit. These initiatives have been done through the Tripartite Permanent Technical Committee (TPTC), which was formally established on 17 February 1983 (Joint Maputo River Basin water resources study – Moçambique, Swaziland and South Africa (EuropeAid/120802/D/SV/ZA), May 2008).

This agreement resulted in inter alia investigations of surface water quality in each nation in order to develop water quality thresholds. This investigation is captured in the Joint Maputo River basin water resources study – Moçambique, Swaziland and South Africa. Surface water quality supporting report 7/2007. However, the monitoring areas are outside of the catchments within which the Waterfall Dam is located, and its findings are not relevant.

Figure 7 provides a broad overview of the key prevailing surface water quality parameters with Phosphate being an element within the project area that specifically needs to be better managed and its introduction into the water resource reduced.

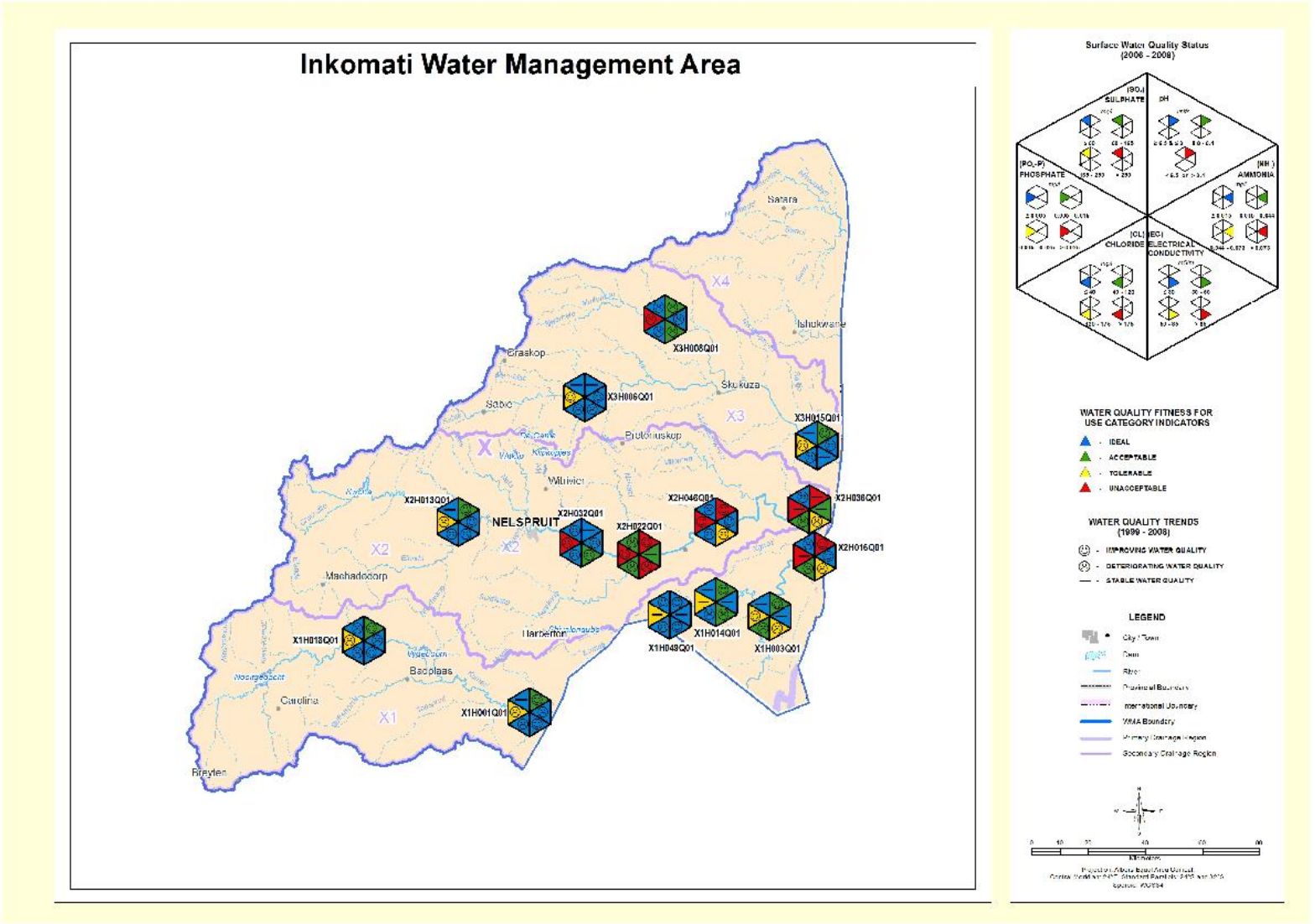


Figure 5. Inkomati Water Management Area (WMA) indicating surface water quality status for key parameters (pH, NH3, EC, Cl, PO4-P & SO4 respectively, in a clockwise direction from twelve o'clock in the legend for each area) with Phosphate below acceptable levels, only considered tolerable.

(k) the probable duration of any undertaking for which a water use is to be authorised.

On an Environmental Authorisation it would state that the authorisation is granted for a period of twenty (20) years from the date of authorisation, and it stands to reason that the Water Use License should be issued for a concurrent period.