SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments.

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Certified EAP / Member of SAEIES & SASAqS

I, Dr. Brian Michael Colloty declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs (DEA)

Signed: ___________________________ Date: 15 JULY 2015

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**ACRONYMS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
</tr>
<tr>
<td>DWS</td>
<td>National Department of Water and Sanitation</td>
</tr>
<tr>
<td>DWAF</td>
<td>National Department of Water Affairs and Forestry (now DWA)</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>NFEPA</td>
<td>National Freshwater Ecosystem Priority Areas (Nel et al., 2011)</td>
</tr>
<tr>
<td>PES</td>
<td>Present Ecological State Score</td>
</tr>
<tr>
<td>SANBI</td>
<td>South African National Biodiversity Institute</td>
</tr>
<tr>
<td>SC&amp;A</td>
<td>Scherman Colloty &amp; Associates</td>
</tr>
</tbody>
</table>
1 Introduction

Scherman Colloty & Associates cc (SC&A) was appointed by EOH Coastal and Environmental Services as an independent specialist to evaluate the aquatic ecological aspects of the proposed rehabilitation of and upgrade of various sections of the National Route 2 by SANRAL (South African National Roads Agency Ltd.) as follows:

Project 1 (Figure 1)

- The proposed development consists of the construction of various safety improvements on the N2 and the R63. These improvements include:
  - Reconstruction of a section of the N2 from Bulembu Airport to the Buffalo River Bridge in King Williams Town. This may include major works to the Tshoxa River bridges and the rail over road bridge at KM 1.89 as well as extensive earth and drainage works, layer works and surfacing;
  - Rehabilitation of the N2 through King Williams Town along a route from the Buffalo River Bridge along Cathcart Street, Buffalo Street; Grey Street and Alexandra Road to the Zwelitsa turn-off, including improvements to drainage, road repairs, and new surfacing;
  - Rehabilitation of the R63 from Alexandra Road in King Williams Town to Bhisho, including improvements to drainage, road repairs and new surfacing;
  - Construction of a ramp and a link road on the N2 between the Zwelitsha turnoff and the MR0688.
  - Construction of a new interchange (off and onramp) at Breidbach, which may include a reinforced concrete structure with the necessary road works; and
  - Formalization of pedestrian, taxi and bus facilities along the route.

Project 2 (Figure 2)

The rehabilitation of Section 18 on the N2 National Route from Tetyana (km24.00) to Sitebe Komkulu (km41.00), in the Eastern Cape Province.

This document reports on results obtained in a survey of the regional literature and observations made during a site visit conducted in July 2015. The main objective of this report is to provide comment on the potential impact of the proposed development areas based on any constraints as a result of the presence of any sensitive aquatic habitats.

Several important national, provincial scale conservation plans were also reviewed, with the results of those studies being included in this report. Most conservation plans are produced at a course scale so it thus important to verify the actual status of the study area during this initial phase, prior to the final development plan being produced.

Certain aspects of the development may also trigger the need for Section 21, Water Use License Applications such as development within 500m of a wetland boundary or river crossings. These applications must be submitted to the relevant Department of Water and Sanitation Office, and information contained in this report must be used in the supporting documentation.
1.1 Terms of reference

- An aquatic biodiversity assessment of the study area. This will cover the study area and a 500m development buffer in relation to available information on the aquatic vegetation and fish.
- Maps depicting demarcated aquatic and wetland vegetation delineated to a scale of 1:10 000, following the methodology described by the Department of Water and sanitation (DWS, previously DWA), together with a classification of delineated wetland areas, according to the methods contained in the Level 1 WET-Health methodology and the latest National Wetland Classification System (2010).
- The determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any waterbodies, estimating their biodiversity, conservation and ecosystem function importance with regard ecosystem services.
- Recommend buffer zones and No-go areas around any delineated aquatic vegetation areas based on the relevant legislation (e.g. Eastern Cape Biodiversity Conservation Plan guidelines) or best practice. SC&A also has access to geographic information that forms part of the latest National Freshwater Ecosystems Priority Areas (Nel et al, 2011) Atlas being completed by the CSIR.
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated aquatic vegetation units.
- Recommend specific actions that could enhance the aquatic functioning in the areas, allowing the potential for a positive contribution by the project.
- Supply the client with geo-referenced GIS shape files of the waterbodies as per the required specifications supplied.

The above detail could be required for inclusion in the respective water use license application / GA documents submitted to DWS should these be required
1.2 Limitations

In order to obtain a comprehensive understanding of the dynamics of both the flora and fauna of both the terrestrial and aquatic communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. Due to time constraints these long-term studies are not always feasible and are mostly based on instantaneous sampling.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

Furthermore, additional information may come to light during a later stage of the process or development. This company, and/or specialist investigators do not accept any responsibility for conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from the surveys or requests made to them at the time of this report as produced or based on the timing of the surveys.
2 Project localities

Projects 1 and 2 are located within the central and eastern portion of the Eastern Cape coastal region. (Figure 1 & 2). The various road projects will see the construction of various upgrades along the N2, and in the case of the King Williams Town project will include section of other roads (R63), interchanges and facilities for pedestrians and taxis.

Figure 1: A map showing the sections along the affected roads (in grey) that will be upgrades in and around King Williams Town. The mainstem rivers are indicated in yellow

Figure 2: A map showing the N2 Section 18 (red line) near the Mbashe River that will be upgraded. The mainstem rivers are indicated in yellow
Figure 3: The respective quaternary catchments within the King Williams Town study region indicated by the red line together with the main stem river systems.

Figure 4: The respective quaternary catchments within the N2 Section 18 study region indicated by the red line together with the main stem river systems.
3 Project description

A detailed project description is contained in the Basic Assessment Reports supporting documentation, but the project proposes to rehabilitate the roads over a short term period. Present water course crossings will also be upgraded or rehabilitated as required.

Plate 1: A photograph taken near the R63, showing the typical water courses and man-made dams observed within the King Williams Town area

Plate 2: A view of a steep drainage lines with signs of erosion and degradation
4 Results

4.1 Aquatic environment – Water courses and drainage lines

There were a number of, perennial, non-perennial watercourses and drainage lines (Plate 1) within the study areas. These are as follows (Figure 3 & 4).

The quaternary catchments include:

Project 1 - KWT
- R20D – Tshoxa / Buffulo / Ngqokweni
- R20E - Yellowwoods

Project 2 – Section 18
- T13A - Mtentu
- T13B - Mbashe
- T13C – Munyu / Dutywa

What is notable is the large proportion of eroded areas within the in most of the study area catchments (Plate 2). While other areas of the King Williams Town portion, such as the Buffalo and Yellowwoods systems were invaded by alien vegetation with little remaining natural riparian vegetation (Plate 3). While most of the dams and have mistakenly been classified as natural wetlands in the National Freshwater Ecosystems Priority Areas (NFEPA) assessment (See Plate 1). Sedimentation and erosion was a particular feature in the Mbashe River catchments (Plate 4).

An assessment of all of the systems was conducted in 2012/2013 by SC&A and now forms part of the revised Present Ecological State (PES) and Ecological Importance and Ecological Sensitivity Assessment (EI/ES) assessment published by the Department of Water and Sanitation (DWS, 2014). This included all aspects such as water quality, riparian vegetation, invertebrates, fish and hydrology at a subquaternary catchment level.

Based then on the available information and again confirmed during the site visit, the majority of the main water courses within the study areas, when considering the remainder of the downstream catchments were rated as being Moderately to Largely Modified (see summary below for individual areas and catchments).

The exception being the Yellowwoods River (7775), near King Williams Town, although rated as Largely Modified (PES) = D, while the ES and EI scores where both HIGH (DWS, 2014). This is due to the riparian zones largely being intact, while the riverbed contains a high degree of habitat diversity. This in turn has resulted in habitat that has known populations of aquatic invertebrates (with high rarity scores) and fish such as the Endangered Sandelia bainsii (Eastern Cape Rocky). This particular group of fish found in the Yellowwoods/ Buffalo River catchments is thought to be genetically distinct from other populations found in the Fish / Kowie river systems.

The Project 1 area could also affect another catchment that was rated with HIGH EI & ES scores, (see summary below), however the roads only affects a small portion of this catchment and none of the associated water courses.

The N2 Section 18 portion of the catchment affects systems mostly associated with the Mtentu / Mbashe River catchments and this and the DWS (2014) assessment (summarized below) indicated
that the systems were Moderately Modified (PES = C) and retained Moderate EI and ES scores. The 6934 catchment was rated as Largely Natural (PES = B) as this catchment contained riparian habitat that was marginally better than the surrounding areas, but the proposed road upgrades (a small portion of this catchment) would have no direct impact on any water courses.

The smaller drainage lines due to upstream erosion, grazing, agriculture, the large number of dams and alien vegetation or *Vachellia* encroachment, the overall Ecological Importance and Ecological Sensitivity for all the systems were rated as LOW (based in findings in this study for both project areas). These ratings were based on the fact that the study areas could still contain valuable intact riparian and instream habitat, which would contain several sensitive fish and invertebrate species in downstream areas.

The results for each of the affected Sub-quaternary catchments are summarised below:
Where SQ= Subquaternary catchment, PES = Present Ecological State, ES = Ecological Sensitivity and EI = Ecological Importance.

**Project 1 (Catchment key below)**

<table>
<thead>
<tr>
<th>Subquaternary Reach</th>
<th>Present Ecological State Score</th>
<th>ES</th>
<th>EI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7775</td>
<td>D</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>7997</td>
<td>C</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>8018</td>
<td>C</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>8032</td>
<td>D</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>7973</td>
<td>C</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>7878</td>
<td>C</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Note – only a very small portion of the existing road falls within Subquaternary catchment 7878
Project 2 (Catchment key below)

<table>
<thead>
<tr>
<th>Subquaternary Catchment</th>
<th>Present Ecological State Score</th>
<th>ES</th>
<th>EI</th>
</tr>
</thead>
<tbody>
<tr>
<td>6781</td>
<td>C</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>6866</td>
<td>C</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>6934</td>
<td>B</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Note – only a small portion of the existing road falls within Subquaternary catchment 6934
Plate 3: A view of the Yellowwoods River crossings with the riparian zone vegetation being encroached by indigenous *Vachellia karroo* and alien *Syringa (Melia azedarach)* trees

Plate 4: The low plant cover and highly eroded slopes of the small tributaries of the Mbashe River near the N2 bridge crossing
The National Freshwater Ecosystem Priority Areas (Nel, et al. 2011) for the reasons above indicated that project areas traverses important Freshwater Ecosystems Priority Areas (FEPAs), i.e. Fish Corridors and important upstream catchments. This is again due to the fact the riparian and instream areas are continuous and sensitive fish and invertebrates in downstream areas / surrounding catchments are present. However the Eastern Cape Biodiversity Conservation Plan (ECBCP) of Berliner and Desmet (2007) indicated that the road upgrades for both projects areas don’t occur within any Aquatic Critical Biodiversity Areas (CBAs) (Figure 5 & 6).

Figure 5: Results of the National Freshwater Ecosystem Priority Assessment for the Project 1 study area (Nel et al., 2011)

Figure 6: Results of the National Freshwater Ecosystem Priority Assessment for the Project 2 study area (Nel et al., 2011)
4.2 Wetland delineation and Conservation & Importance

The National Wetland Inventory (SANBI), which is contained in the National Freshwater Ecosystem Priority Areas (NFEPA) spatial database, indicated that the study area contains several wetlands (Figure 7 & 8).

For Project Area 1, these were confirmed all to be artificial impoundments or dams as shown in Figure 7. None of these had any extensive wetland habitat that support larger numbers of species. The only biota included a few weavers using the reeds that had grown due to the sedimentation within these systems. None of the plant or animal species are of conservation concern.

With regard the Present Ecological State scores (See appendix for the methods), the man-made farm dams were not rated as the road upgrades will not impact on these artificial systems.

Figure 7: Wetland types and distribution within the study Project 1 area

With regard Project Area 2 – Section 18 of the N2, no natural wetlands were observed, with only farm dams being observed. Figure 8 indicates wetlands within the Mbashe River, but these are all open water areas, with small areas on instream riverine habitat are not considered wetlands.

Figure 8: Wetland types and distribution within the study Project 1 area
5 Ecological sensitivity assessment

Based on the findings of this study, the various habitats (rivers) could be ranked in terms of their sensitivity to development, using the following criteria, listed in order of importance, i.e. the habitat or Present Ecological State score:

- Contained Species of Special Concern (SSC)
- Habitat was protected under a form of legislation
- Exhibited a high degree of biodiversity
- Exhibited a limited degree of degradation
- A unique habitat that is not well represented within the region
- Provided an important ecosystem role or support system, e.g. ecological corridor

However with the exception of the larger water course crossings (currently bridge crossings), all the systems would have a similar sensitivity (Moderate) due to the potential construction impacts such as sedimentation and erosion.

Wetlands were not included in this assessment as these are all artificial impoundments.
6 Assessment of Impacts and Identification of Management Actions

It has been determined that the impacts would largely occur during the construction phase (habitat disturbance) which increases the potential for erosion and sedimentation (bare soils), while the operation phase could present hydrological impacts that could result in downstream erosion and sedimentation. The loss of any wetlands were not assessed as the road upgrades would not impact on these areas. Similarly, the impacts would be the same for both projects areas as the roads are existing, and the overall sensitivity for the majority of the systems was low.

6.1 - Impact 1: Changes to the hydrological regime and increased potential for erosion

<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact Description</th>
<th>Nature of impact</th>
<th>Temporal</th>
<th>Spatial</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Significance Pre-mitigation</th>
<th>Mitigation</th>
<th>Significance Post-mitigation</th>
</tr>
</thead>
</table>
| Loss of vegetation, and upgrading of the various road crossings could result in changes in the hydrology resulting in erosion. | Due to the nature of the proposed project this would start at the onset of the construction phase, but persist in the long term in the operational phase impact, limited to once the roads, any road crossings, stormwater management features, erosion protection structures have been constructed. These structures would probably interfere with natural run-off patterns, either diverting or increasing the velocity of surface water flows. This then has the potential to increase the potential for erosion. | Direct | Permanent | Localised | Possible | Moderate | MODERATE | • Stormwater and any runoff generated by the hard surfaces should be discharged into retention swales or detention ponds.  
• Additional energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but would support the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained.  
• Any crossings must be designed in such a manner so as not to impede or divert any baseflows or increase upstream flood inundation. The use portal culverts spanning up to 7m have been suggested for the large crossings and pipe culverts for the smaller crossings. It is however recommended that box culverts be selected over pipe culverts as they are less restrictive in terms of flow | LOW |
6.2 - Impact 2: Increased velocity of surface water flows – reduction in permeable surfaces

<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact Description</th>
<th>Nature of impact</th>
<th>Temporal</th>
<th>Spatial</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Significance Pre-mitigation</th>
<th>Mitigation</th>
<th>Significance Post-mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of vegetation, and upgrading of the various road crossings could result in changes in the hydrology resulting due to changes in permeable surfaces</td>
<td>Loss of vegetation and the replacement of the areas with hard engineered surfaces</td>
<td>Direct</td>
<td>Permanent</td>
<td>Localised</td>
<td>Possible</td>
<td>Moderate</td>
<td>MODERATE</td>
<td>Stormwater and any runoff generated by the hard surfaces should be discharged into retention swales or detention ponds. Additional energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but would support the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. Any upgraded crossings must be designed in such a manner so as not to impede or divert any baseflows or increase upstream flood inundation. The use portal</td>
<td>LOW</td>
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</table>
culverts spanning up to 7m have been suggested for the large crossings and pipe culverts for the smaller crossings. It is however recommended that box culverts be selected over pipe culverts as they are less restrictive in terms of flow and also aid in reducing habitat fragmentation.

Reference to EMP section:
EMP to be completed after review of draft basic assessment report.

### 6.3 - Impact 3: Impact of changes to water quality

<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact Description</th>
<th>Nature of impact</th>
<th>Temporal</th>
<th>Spatial</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Significance Pre-mitigation</th>
<th>Mitigation</th>
<th>Significance Post-mitigation</th>
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<tr>
<td>Presently little is known about the water quality of the water courses directly in the study area, but it is assumed due to the activities in the study area, that the aquatic systems contain some form of pollutants (e.g. cattle and solid dung) during construction various materials, such as sediments, diesel, oils and cement, could pose a threat to the continued functioning downstream areas, if by chance it is dispersed via surface run-off, or are allowed to permeate into the groundwater. The possible negative changes to water quality during the operational phase would be limited to sedimentation and erosion related issues</td>
<td>During construction various materials, such as sediments, diesel, oils and cement, could pose a threat to the continued functioning downstream areas, if by chance it is dispersed via surface run-off, or are allowed to permeate into the groundwater. The possible negative changes to water quality during the operational phase would be limited to sedimentation and erosion related issues</td>
<td>Direct</td>
<td>Permanent</td>
<td>Localised</td>
<td>Possible</td>
<td>Moderate</td>
<td>MODERATE</td>
<td>Construction Phase</td>
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<td>• Chemicals used for construction must be stored safely on site and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early.</td>
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<td>• Littering and contamination of water sources during construction must be prevented by effective construction camp management.</td>
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<td>• Emergency plans must be in place in case of spillages onto road surfaces and water courses.</td>
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<td></td>
<td>• No stockpiling should take place within a water course.</td>
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</tbody>
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LOW
<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact Description</th>
<th>Nature of impact</th>
<th>Temporal</th>
<th>Spatial</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Significance Pre-mitigation</th>
<th>Mitigation</th>
<th>Significance Post-mitigation</th>
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</thead>
<tbody>
<tr>
<td>waste) as eutrophication was observed in area near the King Williams Town for example</td>
<td>assessed in Section 6.1. These negative impacts would persist into the medium term.</td>
<td></td>
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<td></td>
<td></td>
<td>• All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.</td>
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<td>• Stockpiles must be located away from river channels.</td>
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<td></td>
<td></td>
<td></td>
<td>• Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks.</td>
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<td>• The construction camp and necessary ablution facilities meant for construction workers must be beyond the 32m buffer described previously.</td>
<td></td>
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</tbody>
</table>

**Reference to EMP section:**
EMP to be completed after review of draft basic assessment report.
Conclusion and recommendations

Several habitats and water courses of interest were highlighted in this study, which could be impacted upon by the proposed road upgrades. Based on observations in the field it was found that with mitigation all the impacts would be rated as LOW.

The project has in fact the potential to enhance the functioning of the observed water courses by proposing larger culverts where pipe culverts are currently installed and or improving the current bridges.

Further recommendations could be provided once more detail on any road crossings have been developed by the engineering team, any of the proposed mitigations listed in the impact assessment must be adhered to.
8 References


9 Appendix 2 - Wetland delineation and assessment

During this study and due to the nature of the seasonal wetland and watercourses observed, it was decided that the accepted National Wetlands Classification System (NWCS) be adopted. This classification approach has integrated aspects of the HGM approach used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (SANBI, 2009) uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (SANBI, 2009). Several transects were sampled perpendicular to the wetlands in which information of the soils (cores) and vegetation were collected.

The NWCS has a six tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 2). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (Level 1), based on the degree of connectivity the particular systems has with the open ocean (greater than 10 m in depth). Level 2 then categorises the regional wetland setting using a combination of biophysical attributes at the landscape level, which operate at a broad bioregional scale. This is opposed to specific attributes such as soils and vegetation.

**Level 2** has adopted the following systems:
- Inshore bioregions (marine)
- Biogeographic zones (estuaries)
- Ecoregions (Inland)

**Level 3** of the NWCS assess the topographical position of inland wetlands as this factor broadly defines certain hydrological characteristics of the inland systems. Four landscape units based on topographical position are used in distinguishing between Inland systems at this level. No subsystems are recognised for Marine systems, but estuaries are grouped according to their periodicity of connection with the marine environment, as this would affect the biotic characteristics of the estuary.

**Level 4** classifies the hydrogeomorphic (HGM) units discussed earlier. The HGM units are defined as follows:
- Landform – shape and localised setting of wetland
- Hydrological characteristics – nature of water movement into, through and out of the wetland
- Hydrodynamics – the direction and strength of flow through the wetland

These factors characterise the geomorphological processes within the wetland, such as erosion and deposition, as well as the biogeochemical processes.

**Level 5** of the assessment pertains to the classification of the tidal regime within the marine and estuarine environments, while the hydrological and inundation depth classes are determined for the inland wetlands. Classes are based on frequency and depth of inundation, which are used to determine the functional unit of the wetlands and are considered secondary discriminators within the NWCS.
**Level 6** uses of six descriptors to characterise the wetland types on the basis of biophysical features. As with Level 5, these are non-hierarchal in relation to each other and are applied in any order, dependent on the availability of information. The descriptors include:

(i) Geology;
(ii) Natural vs. Artificial;
(iii) Vegetation cover type;
(iv) Substratum;
(v) Salinity; and
(vi) Acidity or Alkalinity.

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, thus are nested in relation to each other.

The HGM unit (Level 4) is the **focal point of the NWCS**, with the upper levels (Figure 3 – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

![Diagram of the National Wetland Classification System](image)

**Figure 2**: Basic structure of the National Wetland Classification System, showing how ‘primary discriminators’ are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with ‘secondary discriminators’ applied at Level 5 to classify the tidal/hydrological regime, and ‘descriptors’ applied at Level 6 to categorise the characteristics of wetlands classified up to Level 5 (From SANBI, 2009).
9.1.1 Wetland condition and conservation importance assessment

To assess the Present Ecological State (PES) or condition of the observed wetlands, a modified Wetland Index of Habitat Integrity (DWAF, 2007) was used. The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table 2), and provide a score of the Present Ecological State of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind, and is not always suitable for impact assessments. This coupled to degraded state of the wetlands in the study area, a complex study approach was not warranted, i.e. conduct a Wet-Health Level 2 and WET-Ecosystems Services study required for an impact assessment.

The WETLAND-IHI model is composed of four modules. The “Hydrology”, “Geomorphology” and “Water Quality” modules all assess the contemporary driving processes behind wetland formation and maintenance. The last module, “Vegetation Alteration”, provides an indication of the intensity of human landuse activities on the wetland surface itself and how these may have modified the condition of the wetland. The integration of the scores from these 4 modules provides an overall Present Ecological State (PES) score for the wetland system being examined. The WETLAND-IHI model is an MS Excel-based model, and the data required for the assessment are generated during a rapid site visit.
Additional data may be obtained from remotely sensed imagery (aerial photos; maps and/or satellite imagery) to assist with the assessment. The interface of the WETLAND-IHI has been developed in a format which is similar to DWAF’s River EcoStatus models which are currently used for the assessment of PES in riverine environments.

Conservation importance of the individual wetlands was based on the following criteria:

- Habitat uniqueness
- Species of conservation concern
- Habitat fragmentation with regard ecological corridors
- Ecosystem service (social and ecological)

The presence of any or a combination of the above criteria would result in a HIGH conservation rating if the wetland was found in a near natural state (high PES). Should any of the habitats be found modified the conservation importance would rate as MEDIUM, unless a Species of conservation concern was observed (HIGH). Any systems that was highly modified (low PES) or had none of the above criteria, received a LOW conservation importance rating. Wetlands with HIGH and MEDIUM ratings should thus be excluded from development with incorporation into a suitable open space system, with the maximum possible buffer being applied. Wetlands which receive a LOW conservation importance rating could be included into stormwater management features, but should not be developed so as to retain the function of any ecological corridors.