PROPOSED SEWERAGE INFRASTRUCTURE, MOLTENO, EASTERN CAPE PROVINCE

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AQUATIC IMPACT ASSESSMENT

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**REVISIONS TRACKING TABLE**

<table>
<thead>
<tr>
<th>Name</th>
<th>Responsibility</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caitlin Smith</td>
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<td>May 2015</td>
</tr>
<tr>
<td>Dr Cherie-Lynn Mack</td>
<td>Reviewer</td>
<td></td>
<td>May 2015</td>
</tr>
</tbody>
</table>

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1 INTRODUCTION

1.1 Project description

The Chris Hani District Municipality (CHDM) is proposing to construct sewerage infrastructure in the area of Molteno, within the Inkwanca Local Municipality of the Eastern Cape. The activity entails the construction of a main pump station and a 350 mm diameter sewage rising main (pipeline), with an initial throughput of approximately 55 l/s. The pipeline will extend from the main pump station in the township of Nomonde, eastwards across the Stormbergspruit River to the Molteno Wastewater Treatment Works (WWTW).

An aquatic impact assessment was commissioned in order to assess the ecological importance of the aquatic environment through which the pipeline will pass.

The “study area” can be defined as 50 m upstream and downstream of the crossing point as well as 50 m from the crossing point along each river bank.

Figure 1.1: Location of the proposed pipeline. It crosses the Stormbergspruit River at the point indicated in blue.
1.2 Alternatives

1.2.1 Trenched pipeline (preferred- trenching within stream bed)

This consists of digging an open trench in the stream bottom, laying the pipe and then backfilling the trench. Depending on the prevailing conditions (weather, stream flow, etc.) this can be achieved with or without the use of temporary coffer dams and stream diversion techniques. This is the preferred alternative as it is significantly cheaper to construct than an above ground pipeline.

1.2.2 Above ground pipeline (pipe bridge across the watercourse)

A pipe bridge is a bridge for running a pipeline over a river. Pipe bridges are, as a rule, only built when it is not possible to run the pipeline on a conventional bridge or under the river.

Table 1.1. Comparison of pipeline alternatives

<table>
<thead>
<tr>
<th>Pipeline alternative</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative A- trenched pipeline</td>
<td>• No additional surface support is required</td>
<td>• Trenching is more invasive to the environment</td>
</tr>
<tr>
<td>(preferred alternative)</td>
<td>• Less vulnerable to vandalism/theft</td>
<td>• If leaks occur pipe will have to be excavated to repair them</td>
</tr>
<tr>
<td></td>
<td>• Cheaper to construct</td>
<td>• Leaks are not easily detectable</td>
</tr>
<tr>
<td>Alternative B- above ground pipeline</td>
<td>• Less damage to the environment as trenching is not required</td>
<td>• Pipeline is easily damaged</td>
</tr>
<tr>
<td></td>
<td>• Minimal leakage as pipe can be repaired easily and leaks are easily detected</td>
<td>• Sagging of pipeline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vulnerable to vandalism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• More expensive than trenching</td>
</tr>
</tbody>
</table>

1.3 Objectives and Terms of Reference

The objectives of the aquatic assessment were to:

- Provide a general description of the status of the water resources of the area (in particular the Stormbergspruit River) according to published literature.
- Provide a general description of the natural aquatic environment in the vicinity of where the proposed rising main (pipeline) will cross the river.
- Identify potential impacts of the proposed construction on the aquatic environment.

1.4 Approach

The study site and surrounding areas were assessed using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current biodiversity programmes and plans.

Further to the above, a site visit was conducted in March 2015. The site visit served to inform potential impacts of the proposed project and how significantly it would impact on the surrounding aquatic environment.
1.5 Assumptions and Limitations

This report is based on currently available information and, as a result, the following limitations and assumptions are implicit:

- The report is based on limited project information provided by the client.
- Descriptions of the natural environments are based on limited fieldwork and available literature.
2 RELEVANT LEGISLATION

The following legislation is relevant when considering aquatic impacts identified during the Planning and Design, Construction and Operation Phase of the proposed sewerage infrastructure.

Table 2.1: Environmental legislation considered in the preparation of the Aquatic Report for the construction of a pipeline over the Stormbergspruit River.

<table>
<thead>
<tr>
<th>Title of Environmental legislation, policy or guideline</th>
<th>Implications for the proposed rising main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constitution Act (108 of 1996)</td>
<td>Obligation to ensure that the proposed development will not result in pollution and ecological degradation; and Obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development.</td>
</tr>
<tr>
<td>National Environmental Management Act (NEMA) (107 of 1998)</td>
<td>The developer must apply NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA. The developer must apply the principles of Integrated Environmental Management and consider, investigate and assess the potential impact of existing and planned activities on the environment, socio-economic conditions and the cultural heritage.</td>
</tr>
<tr>
<td>National Environment Management: Biodiversity Act (10 of 2004)</td>
<td>The proposed development must conserve endangered ecosystems and protect and promote biodiversity; Must assess the impacts of the proposed development on endangered ecosystems; No protected species may be removed or damaged without a permit; The proposed site must be cleared of alien vegetation using appropriate means.</td>
</tr>
<tr>
<td>National Water Act (36 of 1998)</td>
<td>Provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality.</td>
</tr>
</tbody>
</table>
3 ASSESSMENT METHODOLOGY

3.1 Aquatic Assessment

The aim of this assessment is to identify the aquatic importance of the Stormbergspruit River and to evaluate the sensitivity of the river.

The following literature was consulted for the desktop assessment of the river:

- The Eastern Cape Biodiversity Conservation Plan (2007)
- The National Freshwater Ecosystems Protected Areas Programme (2011)

A site visit was also conducted on 09 March 2015 in order to obtain photographic evidence of the current state of the Stormbergspruit River at the proposed crossing site.

3.2 Impact assessment

3.2.1 Impact rating methodology

To ensure a direct comparison between various specialist studies, a standard rating scale has been defined and will be used to assess and quantify the identified impacts. This is necessary since impacts have a number of parameters that need to be assessed. Five factors need to be considered when assessing the significance of impacts, namely:

- Relationship of the impact to **temporal scales** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

- Relationship of the impact to **spatial scales** - the spatial scale defines the physical extent of the impact.

- The severity of the impact - the **severity/beneficial scale** is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party.

  The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just ‘compensation’, but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

- The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

- Each criterion is ranked with scores assigned as presented in Table 3-2 to determine the **overall significance** of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 3-3, to determine the overall significance of the impact. The overall significance is either negative or positive.
The significance scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of a social nature need to reflect the values of the affected society.

**Cumulative Impacts**
Cumulative impacts affect the significance ranking of an impact because the impact is taken in consideration of both onsite and offsite sources. For example, pollution making its way into a river from a development may be within acceptable national standards. Activities in the surrounding area may also create pollution which does not exceed these standards. However, if both onsite and offsite activities take place simultaneously, the total pollution level may exceed the standards. For this reason it is important to consider impacts in terms of their cumulative nature.

**Seasonality**
Although seasonality is not considered in the ranking of the significance, if may influence the evaluation during various times of year. As seasonality will only influence certain impacts, it will only be considered for these, with management measures being imposed accordingly (i.e. dust suppression measures being implemented during the dry season).

**Table 3.2. Significance Rating Table.**

<table>
<thead>
<tr>
<th>Temporal Scale (The duration of the impact)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term</td>
<td>Less than 5 years (many construction phase impacts are of a short duration).</td>
</tr>
<tr>
<td>Medium term</td>
<td>Between 5 and 20 years.</td>
</tr>
<tr>
<td>Long term</td>
<td>Between 20 and 40 years (from a human perspective almost permanent).</td>
</tr>
<tr>
<td>Permanent</td>
<td>Over 40 years or resulting in a permanent and lasting change that will always be there.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spatial Scale (The area in which any impact will have an affect)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Impacts affect an individual.</td>
</tr>
<tr>
<td>Localised</td>
<td>Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.</td>
</tr>
<tr>
<td>Project Level</td>
<td>Impacts affect the entire project area.</td>
</tr>
<tr>
<td>Surrounding Areas</td>
<td>Impacts that affect the area surrounding the development</td>
</tr>
<tr>
<td>Municipal</td>
<td>Impacts affect either the Local Municipality, or any towns within them.</td>
</tr>
<tr>
<td>Regional</td>
<td>Impacts affect the wider district municipality or the province as a whole.</td>
</tr>
<tr>
<td>National</td>
<td>Impacts affect the entire country.</td>
</tr>
<tr>
<td>International/Global</td>
<td>Impacts affect other countries or have a global influence.</td>
</tr>
<tr>
<td>Will definitely occur</td>
<td>Impacts will definitely occur.</td>
</tr>
</tbody>
</table>

**Degree of Confidence or Certainty**
(The confidence with which one has predicted the significance of an impact)
<table>
<thead>
<tr>
<th>Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite</td>
<td>More than 90% sure of a particular fact. Should have substantial supportive data.</td>
</tr>
<tr>
<td>Probable</td>
<td>Over 70% sure of a particular fact, or of the likelihood of that impact occurring.</td>
</tr>
<tr>
<td>Possible</td>
<td>Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.</td>
</tr>
<tr>
<td>Unsure</td>
<td>Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.</td>
</tr>
</tbody>
</table>

### Table 3.3 Impact Severity Rating

**Impact severity**

(The severity of negative impacts or how beneficial positive impacts would be on a particular affected system or affected party)

<table>
<thead>
<tr>
<th>Impact severity</th>
<th>Very severe</th>
<th>Very beneficial</th>
</tr>
</thead>
<tbody>
<tr>
<td>An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.</td>
<td>A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>Beneficial</td>
<td></td>
</tr>
<tr>
<td>Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.</td>
<td>A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.</td>
<td></td>
</tr>
<tr>
<td>Moderately severe</td>
<td>Moderately beneficial</td>
<td></td>
</tr>
<tr>
<td>Medium to long term impacts on the affected system(s) or party(ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.</td>
<td>A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a ‘slight’ improvement in sewage effluent quality.</td>
<td></td>
</tr>
<tr>
<td>Slight</td>
<td>Slightly beneficial</td>
<td></td>
</tr>
<tr>
<td>Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.</td>
<td>A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.</td>
<td></td>
</tr>
<tr>
<td>No effect</td>
<td>Don’t know/Can’t know</td>
<td></td>
</tr>
<tr>
<td>The system(s) or party(ies) is not affected by the proposed development.</td>
<td>In certain cases it may not be possible to determine the severity of an impact.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3.4 Overall Significance Rating

**Overall Significance**

(The combination of all the above criteria as an overall significance)

<table>
<thead>
<tr>
<th>Overall Significance</th>
<th>VERY HIGH NEGATIVE</th>
<th>VERY BENEFICIAL</th>
</tr>
</thead>
</table>
| These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in **severe** or **very severe** effects, or **beneficial** or **very beneficial** effects. **Example:** The loss of a species would be viewed by informed society as being of VERY HIGH significance. **Example:** The establishment of a large amount of infrastructure in a rural area, which previously
had very few services, would be regarded by the affected parties as resulting in benefits with
VERY HIGH significance.

<table>
<thead>
<tr>
<th>HIGH NEGATIVE</th>
<th>BENEFICIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.</td>
<td></td>
</tr>
</tbody>
</table>

**Example:** The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.

**Example:** The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.

<table>
<thead>
<tr>
<th>MODERATE NEGATIVE</th>
<th>SOME BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.</td>
<td></td>
</tr>
</tbody>
</table>

**Example:** The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.

<table>
<thead>
<tr>
<th>LOW NEGATIVE</th>
<th>FEW BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.</td>
<td></td>
</tr>
</tbody>
</table>

**Example:** The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.

**Example:** The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.

<table>
<thead>
<tr>
<th>NO SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are no primary or secondary effects at all that are important to scientists or the public.</td>
</tr>
</tbody>
</table>

**Example:** A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.

<table>
<thead>
<tr>
<th>DON’T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information.</td>
</tr>
</tbody>
</table>

**Example:** The effect of a particular development on people’s psychological perspective of the environment.
4 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

The study site and surrounding areas were described using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current biodiversity programmes, and plans, followed by a site visit in order to obtain photographic evidence of the current state of the aquatic environment.

4.1 Desktop Investigation

Published literature on the ecology of the area was referenced in order to describe the study site in the context of the region and the Eastern Cape Province. The following documents/plans are referenced:

- The Eastern Cape Biodiversity Conservation Plan (2007)
- The National Freshwater Ecosystems Protected Areas Programme (2011)

The Stormbergspruit River is located within quaternary catchment D14C (primary catchment D) and falls within Water Management Area (WMA) 13, the Upper Orange region.

Figure 4.1: Quaternary catchment locality, D14C.

WMA 13 (Upper Orange) lies predominantly in the Free State, but also occupies portions of the Eastern and Northern Cape provinces. It borders on Lesotho in the east as well as on six other water management areas. The Orange River is the main river in the WMA and is also the largest and longest river in South Africa. Other major rivers in this WMA are the Modder, Riet and Caledon Rivers.
According to the 2006 river shapefiles from National Geospatial Information (Department of Rural Development and Land Reform) there is a non-perennial river (unnamed) running alongside the Stormbergspruit River near the Molteno Waste Water Treatment Works (Figure 4.2). This river was not, however, evident at the site visit conducted in March 2015, but is clear on Google Earth imagery.

![Figure 4.2: Rivers near the study area.](image)

### 4.1.1 The National Spatial Biodiversity Assessment (2004)

The National Spatial Biodiversity Assessment of 2004 is a framework document within which fine-scale conservation planning in identified priority areas should occur. The NSBA integrates terrestrial, river, marine, estuarine and wetland ecosystems using available spatial data, relevant conservation planning software and a series of expert and stakeholder workshops. It is important to note that the NSBA was conducted at a national scale (1:250 000), and thus can only provide a general context for biodiversity assessments at a local level.

When establishing a conservation plan, river integrity is recommended by the NSBA as a suitable method for determining the most suitable rivers for conservation. Rivers that are largely natural should be the first choice for meeting biodiversity targets. If the targets cannot be met in rivers with a high ecological integrity, then rivers with a moderate integrity (i.e. those with relatively inexpensive rehabilitation costs) would be the next best option. The NSBA mapped river integrity based on the present ecological status category (PESC) desktop estimates from the national Water Situation Assessment Model.

The Stormbergspruit River (Figure 4.3) is classified as a Class D River meaning it is LARGELY MODIFIED. A Class D River is characterised by a large loss of natural habitat, biota and basic ecosystem functions.
A second important mapping tool used in the NSBA is conservation status. Conservation status aims at identifying threatened ecosystems, and is based on the classification scheme developed by the IUCN to categorise species. Of the 120 rivers in South Africa that have been classified using this categorisation, 44% are critically endangered, 27% are endangered, 11% are vulnerable and 18% are least threatened. The Stormbergspruit River is listed as ENDANGERED (Figure 4.4). Endangered ecosystems have lost large amounts of their original natural habitat, so their functioning is compromised.
4.1.2 National Freshwater Ecosystem Priority Areas (NFEPA), 2011

The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa’s freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or ‘FEPAs’.

FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers
- Maintenance of water supply areas in areas with high water yield
- Identification of connected ecosystems
- Representation of threatened and near-threatened fish species and associated migration corridors
- Preferential identification of FEPAs that overlapped with:
  - Any free-flowing river
  - Priority estuaries identified in the National Biodiversity Assessment 2011
  - Existing protected areas and focus areas for protected area expansion identified in the National Protected Area Expansion Strategy.

The Stormbergspruit River is an Upstream Management Area (Figure 4.5). Upstream Management Areas are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas.
Figure 4.5. Freshwater Ecosystem Priority Area status of the Stormbergspruit River (NFEPA, 2011).
4.1.3 Eastern Cape Biodiversity Conservation Plan (ECBCP)

The ECBCP is a first attempt at detailed, low-level conservation mapping for land-use planning purposes. Specifically, the aims of ECBCP were to map critical biodiversity areas through a systematic conservation planning process. The current biodiversity plan includes the mapping of priority aquatic features, land-use pressures, critical biodiversity areas and develops guidelines for land and resource-use planning and decision-making.

The main outputs of the ECBCP are “critical biodiversity areas” or CBAs, which are allocated the following management categories:

1. CBA 1 = Maintain in a natural state
2. CBA 2 = Maintain in a near-natural state

The ECBCP maps CBAs based on extensive biological data and input from key stakeholders. Although ECBCP is mapped at a finer scale than the National Spatial Biodiversity Assessment (Driver et al., 2005) it is still, for the large part, inaccurate and “course”. Therefore it is imperative that the status of the environment, for any proposed development MUST first be verified before the management recommendations associated with the ECBCP are considered (Berliner and Desmet, 2007). It is also important to note that in absence of any other biodiversity plan, the ECBCP has been adopted by the Provincial Department of Economic Development and Environmental Affairs (DEDEAT) as a strategic biodiversity plan for the Eastern Cape.

As with terrestrial CBAs, aquatic CBAs are grouped into BLMCs. The ECBCP recommends limits (thresholds) to the total amount of land transformation that should be allowed in an ABLMC 1 and 2, if biodiversity is to be conserved. The goal is to maintain sufficiently large intact and well-connected habitat patches in each sub-quaternary catchment.

<table>
<thead>
<tr>
<th>ABLMC</th>
<th>CBA Code</th>
<th>Description of CBAs</th>
<th>ABLMC Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABLMC 1</td>
<td>CBA1</td>
<td>Critically important river sub-catchments; Priority primary catchments for E1 estuaries</td>
<td>Less than 10 % of total area of sub-quaternary catchment</td>
</tr>
<tr>
<td>ABLMC 2a</td>
<td>CBA2</td>
<td>Important sub-catchments, Primary catchment management areas for E2 estuaries</td>
<td>Less than 15 % of total area of sub-quaternary catchment</td>
</tr>
<tr>
<td>ABLMC 2b</td>
<td>CBA3</td>
<td>Catchments of free flowing rivers important for fish migration</td>
<td>Less than 20 % of total area of sub-quaternary catchment</td>
</tr>
</tbody>
</table>

The study area does not fall into an Aquatic CBA1 or CBA2 area (Figure 4.6).
4.1.4 Wetlands

Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the National Freshwater Ecosystem Priority Assessment (NFEPA, 2011). Due to the broad-scale nature of the NFEPA map it is not spatially accurate and therefore some error is expected. The location of NFEPA wetlands was derived from the National Land Cover 2000 (Van Den Berg et al., 2008) and inland water features from the Department of Land Affairs’ Chief Directorate: Surveys and Mapping (DLA-CDSM). All wetlands are classified as either ‘natural’ or ‘artificial’ water bodies.

The NFEPA wetland map identifies important or sensitive wetlands and wetland clusters. A wetland cluster is a group of wetlands all within 1 km of each other and which are surrounded by relatively natural vegetation. Figure 4.7 indicates the wetlands listed in the inventory that occur within the vicinity of the pipeline. These wetlands are all classified as "artificial" wetlands.

On the western side of the Stormbergspruit River the two artificial wetlands are old waste water treatment works (WWTW). On the eastern side of the Stormbergspruit River the artificial wetlands are the new Molteno WWTW, farm dams and what appears to be an old irrigation canal.
4.1.5 Summary of the biodiversity status of the affected river

Table 4.1. Status of the affected river

<table>
<thead>
<tr>
<th>Status</th>
<th>Source</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PES: Class D- Largely Modified</td>
<td>NSBA, 2004</td>
<td>Large loss of natural habitat, biota and basic ecosystem functions</td>
</tr>
<tr>
<td>Conservation status: ENDANGERED</td>
<td>NSBA, 2004</td>
<td></td>
</tr>
<tr>
<td>Upstream Management Area</td>
<td>NFEPA, 2011</td>
<td>Sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas.</td>
</tr>
</tbody>
</table>
4.2 Site survey

Below is a photo sequence showing the proposed water crossing and the surrounding areas:

Plate 4.1: View upstream of proposed river crossing

Plate 4.2: View downstream of proposed river crossing.
Plate 4.3: The river is significantly polluted.
Riparian vegetation noted on site:

**Plate 4.4:** *Phragmites* sp. (common reed)

**Plate 4.5:** *Cirsium vulgare* (Scotch thistle)

**Plate 4.6:** *Pennisetum clandestinum* (Kikoejoegrass)
Figure 4.8. Site photographs at the proposed Stormbergspruit river crossing.
5  IMPACT IDENTIFICATION AND ASSESSMENT

5.1  Identified Impacts

Impacts were identified during the Planning and Design, Construction and Operation Phase of the proposed pipeline through the Stormbergspruit River and adjacent non-perennial river and are described below. These included the consideration of direct, indirect and cumulative impacts that may occur.
Table 5.2: Impacts and mitigation measures for the Planning and Design Phase for both pipeline alternatives.

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>DESCRIPTION OF IMPACT</th>
<th>NATURE OF IMPACT</th>
<th>SPATIAL SCALE (EXTENT)</th>
<th>TEMPORAL SCALE (DURATION)</th>
<th>CERTAINTY SCALE (LIKELIHOOD)</th>
<th>SEVERITY/BENEFICIAL SCALE</th>
<th>SIGNIFICANCE PRE-MITIGATION</th>
<th>MITIGATION MEASURES</th>
<th>SIGNIFICANCE POST-MITIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal and policy compliance</td>
<td>Non-compliance with the laws and policies of South Africa as they pertain to the aquatic environment could lead to unnecessary delays in construction activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.</td>
<td>DIRECT</td>
<td>Localised</td>
<td>Short term</td>
<td>Probable</td>
<td>Moderately severe</td>
<td>MODERATE NEGATIVE</td>
<td>• Ensure that all legal matters pertaining to permitting have been completed prior to construction. In particular, all necessary Water Use Licences must be in order.</td>
<td>LOW NEGATIVE</td>
</tr>
<tr>
<td>ISSUE</td>
<td>IMPACT</td>
<td>NATURE OF IMPACT</td>
<td>SPATIAL SCALE (EXTENT)</td>
<td>TEMPORAL SCALE (DURATION)</td>
<td>CERTAINTY SCALE (LIKELIHOOD)</td>
<td>SEVERITY/ BENEFICIAL SCALE</td>
<td>SIGNIFICANCE PRE-MITIGATION</td>
<td>MITIGATION MEASURES</td>
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<td>Water Quality</td>
<td>During the construction phase, accidental contamination of wet concrete (highly alkaline) in the river could result in flash kills of macro-invertebrates and fish species in the vicinity. (See appendix A).</td>
<td>A DIRECT CUMULATIVE</td>
<td>Localised</td>
<td>Short-term</td>
<td>Possible</td>
<td>Moderately severe</td>
<td>MODERATE NEGATIVE</td>
<td>• No concrete mixing must take place within 32m of the river bank. • A serviced fire extinguisher (to neutralise pH levels if a spill occurs) must be available on site in the event that wet concrete is accidentally spilled into the river. • The mitigation measures in Appendix A must be read in conjunction with this report.</td>
<td>LOW NEGATIVE</td>
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<td>• Same as above</td>
<td>LOW NEGATIVE</td>
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<tr>
<td></td>
<td>During construction, accidental chemical spills in the vicinity of the river will result in water pollution.</td>
<td>B DIRECT CUMULATIVE</td>
<td>Localised</td>
<td>Short-term</td>
<td>Possible</td>
<td>Slight</td>
<td>LOW NEGATIVE</td>
<td>• No machinery should be parked overnight within 50 m of the watercourse. • All stationery should be equipped with a drip tray to retain any oil leaks.</td>
<td>LOW NEGATIVE</td>
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<td>• Same as above</td>
<td>LOW NEGATIVE</td>
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<td>Mobilisation of soil into the stream via erosion will cause sedimentation of ecological habitats downstream of construction. This could decrease the diversity of macroinvertebrate communities.</td>
<td>A DIRECT CUMULATIVE</td>
<td>Downstream</td>
<td>Short-term</td>
<td>Possible</td>
<td>Moderately severe</td>
<td>MODERATE NEGATIVE</td>
<td>• Excavation/trenching should take place during the driest season. • Where possible, silt fences should be installed to collect sediments mobilized during construction. • Banks must be monitored for signs of erosion, and measures must be taken to minimize the erosion as soon as possible.</td>
<td>LOW NEGATIVE</td>
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<tr>
<td>Source</td>
<td>Impact</td>
<td>Effect 1</td>
<td>Effect 2</td>
<td>Effect 3</td>
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<td>Riparian vegetation</td>
<td>DIRECT</td>
<td>Localised</td>
<td>Medium-term</td>
<td>Possible</td>
<td>Slight</td>
<td>LOW NEGATIVE</td>
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<td>Pipe bridge pilings should not be placed on stream banks wherever possible.</td>
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<td>Where this is not possible, ensure that appropriate sediment collection measures are put in place.</td>
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<td>Riparian vegetation should not be placed on stream banks wherever possible.</td>
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<td>Where this is not possible, ensure that appropriate sediment collection measures are put in place.</td>
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<tr>
<td>Hydrology</td>
<td>DIRECT</td>
<td>Localised and downstream</td>
<td>Medium-term</td>
<td>Possible</td>
<td>Severe</td>
<td>HIGH NEGATIVE</td>
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<td>Hydrology</td>
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<td></td>
<td>Coffer dams have the potential to permanently change the flow dynamics in a river, exacerbating scour and enhancing sedimentation. Both of these changes can impact negatively on the aquatic ecosystem.</td>
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<tr>
<td>B</td>
<td>No Impact</td>
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<td></td>
<td>B No Impact</td>
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</table>

EOH Coastal & Environmental Services 24 Molteno Sewerage Infrastructure
Table 6.4: Impacts and mitigation measures for the Operational Phase for trenched pipeline (A) and above ground pipeline (B).

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>IMPACT</th>
<th>NATURE OF IMPACT</th>
<th>SPATIAL SCALE</th>
<th>TEMPORAL SCALE (DURATION)</th>
<th>CERTAINTY SCALE (LIKELIHOOD)</th>
<th>SEVERITY/BENEFICIA L SCALE</th>
<th>SIGNIFICANCE PRE-MITIGATION</th>
<th>MITIGATION MEASURES</th>
<th>SIGNIFICANCE POST-MITIGATION</th>
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<tr>
<td>Maintenance</td>
<td></td>
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<td>• Pipelines MUST be regularly monitored for leaks.</td>
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<td>• If leaks are identified or reported by the public, immediate actions must be taken to repair these leaks.</td>
<td>MODERATE NEGATIVE</td>
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<td>• Same as above</td>
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<tr>
<td>Hydrology and sediment dynamics</td>
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<td>• Ensure that the river bed is rehabilitated to the equivalent of what it was prior to construction.</td>
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<td></td>
<td>• Pipe bridge pilings on the banks or bed of the water course must be designed to limit the effects of scour on the sediment flows in the stream.</td>
<td></td>
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<tr>
<td>Maintenance</td>
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<td>• Pipelines MUST be regularly monitored for leaks.</td>
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<td>• If leaks are identified or reported by the public, immediate actions must be taken to repair these leaks.</td>
<td>MODERATE NEGATIVE</td>
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<td>• Ensure that the river bed is rehabilitated to the equivalent of what it was prior to construction.</td>
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<td>• Pipe bridge pilings on the banks or bed of the water course must be designed to limit the effects of scour on the sediment flows in the stream.</td>
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</tr>
</tbody>
</table>
6 IMPACT STATEMENT, CONCLUSION & RECOMMENDATIONS

6.1 Conclusions

The Chris Hani District Municipality (CHDM) is proposing to construct sewerage infrastructure in the area of Molteno, within the Inkwanca Local Municipality of the Eastern Cape. The activity entails the construction of a main pump station and a 350 mm diameter sewage rising main which crosses the Stormbergspruit River.

An aquatic impact assessment was commissioned in order to assess the ecological importance of the aquatic environment through which the rising main will be trenched, with particular reference to the Stormbergspruit River. This report forms part of the greater EIA process.

A comparison of impacts in terms of the number of impacts per phase is illustrated in Table 7.1 below. HIGH pre-mitigation impacts relate to hydrology and maintenance of the pipeline. The majority of impacts can be mitigated using the recommended mitigation measures to LOW/MODERATE post-mitigation impacts.

Table 7.1: Assessment of pre- and post-mitigation impact significance.

<table>
<thead>
<tr>
<th></th>
<th>PRE-MITIGATION</th>
<th>POST-MITIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW</td>
<td>MOD</td>
</tr>
<tr>
<td>Planning and Design</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Construction</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Operation</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

6.2 Assessment of Alternatives

The preferred pipeline alternative is trenching, however, an above ground pipeline (along a pipe bridge) alternative was also assessed in this report. The latter tends to have a lower environmental impact but above ground pipelines can be easily damaged, are vulnerable to vandalism and are more expensive to construct. No fatal flaw was identified with any of these alternatives.

Trenching is deemed environmentally acceptable provided that construction is carefully managed, the suggested mitigation measures are implemented and construction activities are supervised by a competent ECO.

6.3 Water Use Licensing

A water use licence application is required for crossing the Stormbergspruit River and the non-perennial stream adjacent to it in terms of the following triggers from the National Water Act (No. 36 of 1998):

- Sec 21 (c) - impeding or diverting the flow of water in a watercourse, and
- Sec 21 (i) - altering the bed, banks, course or characteristics of a watercourse.

Both watercourse crossings must be authorised by the Department of Water and Sanitation prior to commencement of construction.
6.4 **Recommendations for the proposed construction of a sewerage pipeline through the Stormbergspruit River**

All the mitigation measures provided below are to be implemented in the Planning and Design, Construction and Operation Phases of the proposed pipeline.

6.4.1 **Planning and Design**

- Ensure that all legal matters pertaining to permitting have been completed prior to construction. In particular, all necessary Water Use Licences must be in order.

6.4.2 **Construction**

- No concrete mixing must take place within 32m of the river bank.
- A serviced fire extinguisher (to neutralise pH levels if a spill occurs) must be available on site in the event that wet concrete is accidentally spilled into the river.
- The mitigation measures in Appendix A must be read in conjunction with this report.
- No machinery should be parked overnight within 50 m of the watercourse.
- All stationery should be equipped with a drip tray to retain any oil leaks.
- Excavation/trenching should take place during the driest season.
- Where possible, silt fences should be installed to collect sediments mobilized during construction.
- Banks must be monitored for signs of erosion, and measures must be taken to minimize the erosion as soon as possible.
- Pipe bridge pilings (if relevant) should not be placed on stream banks wherever possible. Where this is not possible, ensure that appropriate sediment collection measures are put in place.
- Removal of riparian vegetation should take place under the supervision of the ECO.
- Removal of the alien invasive vegetation should be prioritised.
- Banks should be artificially stabilized as soon as possible if significant riparian vegetation is removed.
- Cofferdams must not be left in place for longer than 30 days.
- All work within the river should be completed during the dry season, when flows are at their lowest.
- Water in the river must be allowed to pass downstream of the construction. If necessary this should be achieved via a temporary diversion – this should not be in place for more than 30 days.

6.4.3 **Operation**

- Pipelines MUST be regularly monitored for leaks.
- If leaks are identified or reported by the public, immediate actions must be taken to repair these leaks.
- Ensure that the river bed is rehabilitated to the equivalent of what it was prior to construction.
- Pipe bridge pilings (if relevant) on the banks or bed of the water course must be designed to limit the effects of scour on the sediment flows in the stream.

6.5 **Environmental statement and Opinion of the Specialist**

The potential impacts on the aquatic environment at the proposed pipeline crossing site are considered and deemed to be acceptable, provided that the mitigation measures provided in this report are implemented.
7 REFERENCES


National Environmental Management: Biodiversity Act (No 10 of 2004).


NFEPA Atlas, 2011

Technical Report for the National Freshwater Ecosystem Priority Areas project.


SANBI (bgis.sanbi.org).
Concrete Works – Information and Mitigation

Background

Concrete, cement, mortars, grouts and other Portland cement or lime-containing construction materials are basic or alkaline materials. They are highly toxic to fish and must only be used near water with extreme care.

What are acceptable pH ranges?

A pH level around 7 is typical for most watercourses, and this neutral pH is required for the survival of aquatic organisms. Should the pH rise or drop out of this range, fish and other aquatic organisms will become stressed and may die. Complete isolation of the work area is needed to ensure that pH value in the surrounding waterbody does not rise (become more alkaline) during works. The Ministry of Water, Land, and Air Protection’s British Columbia Approved Water Quality Criteria for pH sets the range for acceptable pH change with respect to fresh water aquatic life between 6.5 and 9.0. However, any increase in pH noted in conjunction with concrete works should be monitored and emergency protection measures implemented in accordance with the best practices below.

Objectives

The objective of this set of best practices is to ensure no concrete materials or leachates enter any watercourses.

Operational or Construction-related Best Practices

To ensure your works meet the requirements of applicable legislation:

Concrete Works

- Use pre-cast concrete structures whenever possible.
- As concrete leachate is alkaline and highly toxic to fish and other aquatic life, ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime containing construction materials (concrete) will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse.
- Concrete materials cast in place must remain inside formed structures.
- Keep a carbon dioxide (CO2) tank with regulator, hose and gas diffuser readily available during concrete work. Use it to release carbon dioxide gas into the affected area to neutralize pH levels should a spill occur. Train workers to use the tank.
- Provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- Report immediately any spills of sediments, debris, concrete fines, wash or contact water. Implement emergency mitigation and clean-up measures immediately.
- Completely isolate all concrete work from any water within or entering into any watercourse or stormwater system.
- Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until completion of the works. Emergency measures will be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is recorded to be below 6.0 or above 9.0 pH units.
- Prevent any water that contacts uncured or partly cured concrete during activities like exposed aggregate wash-off, wet curing, or equipment washing from directly or indirectly entering any watercourse or stormwater system.
• Maintain complete isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C.

• Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units, and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

For further information regarding the safe use of concrete materials, refer to the following websites:

Cement and Concrete: Environmental Considerations
http://www.buildinggreen.com/features/cem/cementconc.html

Carbon Dioxide for Concrete Wash Water Treatment
http://www.praxair.com/Praxair.nsf/d63afe71c771b0d785256519006c5ea1/78b5b272ccfbcdb8885256550069e32d?OpenDocument