FINAL REPORT:

CLOVELLY WETLAND STUDIES

ANNOTATED BIBLIOGRAPHY OF RESEARCH CONDUCTED IN / ON / INCLUDING THE CLOVELLY WETLAND AREA

August 2016

Compiled by Christine Byaruhanga & Nathan Taylor
Assisted by Barbara Schmid

UCT KNOWLEDGE CO-OP

The UCT Knowledge Co-op facilitated this collaborative project with **FOSNA**.
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1) Introduction

The purpose of this project was to compile an annotated list of reports / theses on research conducted in the Clovelly wetland area. It was quite difficult to locate research papers done in this area as all the information does not seem to be located on a centralized platform. Moreover some of the information, particularly on wetland studies as such, is only available on databases accessible only to members. However, after scouring the internet for a while, some relevant pieces were found with a few alterations had to the search criteria such as substituting local landmarks such as “Trappieskop and "Silvermine river" for Clovelly.

The search located only papers on wetland studies as such and the botany of the area, although geology, geography and zoology searches were done. With more leads this search could be deepened if required.

Reports under each subheading are listed according to date of the report, starting with the most recent to the earliest.

2) Wetlands and rivers

a) Desktop classification of inland wetlands

Van Deventer, H., Nel, J., Mbona, N., Job, N., Ewart-Smith, J., Snaddon, K., & Maherry, A. 2016. “Desktop classification of inland wetlands for systematic conservation planning in data-scarce countries: mapping wetland ecosystem types, disturbance indices and threatened species associations at country-wide scale.” *Aquatic Conservation: Marine and Freshwater Ecosystems*. 26: 57-75. DOI:10.1002/aqc.2605.

Abstract:

Data sets on wetlands required for the representation of aquatic ecosystem biodiversity and systematic wetland conservation planning are typically not available or are inadequate, particularly at country-wide scale, which hinders conservation planning. This study demonstrates replicable methods for classifying wetland ecosystem types and condition country-wide using broad-scale data sets in data-scarce countries. A country-wide data set, compiled primarily using remote sensing techniques, was combined with regional and landscape-setting data sets to reflect the ecological and geomorphic biodiversity of wetlands. Geographical Information Systems (GIS) were employed to model wetland types, disturbance indices and identify priority wetlands through threatened faunal species associations using existing data.

Most of the 1 680 306ha of inland wetlands were classified as Natural (80%), of which the majority were located on Valley Floors (68%). However, the national data were found only to represent 54% of wetlands mapped at a local scale, and comparison with local data showed inaccuracies in the types and condition classifications. Problems regarding spatial data quality and scale are discussed and suggestions for improvement are provided. Data sets on freshwater ecosystems can assist in raising awareness and influence policy at a national scale.

b) Proposed underground cable in Clovelly: Implications for freshwater ecosystems

Liz Day. 2012. "Implications for freshwater ecosystems of the installation and long term impacts of a proposed underground cable in Clovelly, City of Cape Town". 22 pp.

Full report attached as Appendix 1.

The Freshwater Consulting Group was appointed to carry out a specialist assessment of the implications of the proposed project for freshwater ecosystems - specifically for the Silvermine river and associated wetlands. The proposed project in its present form was found to be associated with relatively few concerns in terms of its impacts to wetlands. Potential impacts to the Silvermine River and its associated wetlands that have been identified by FCG are considered readily mitigable, and the mitigation measures recommended are, for the most part, best practice measures that, in many cases, would probably form part of the contractor's standard approach in any case.

c) Prioritization of City Wetlands

Kate Snaddon & Liz Day. 2009. "Prioritization of City Wetlands". Freshwater Consulting Group, UCT. Department of Environmental Resource Management. 66 pp.

https://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications/Documents/Prioritisation_of_City_Wetlands_report_2009-08.pdf (accessed Aug 2016)

The report's purpose is to classify wetlands in the Western Cape to inform the decision as to which of these wetlands should be included in the Biodiversity Network / Bioregional Plan. The study largely used desktop assessment of aerial photography.

d) Identification and collation of existing information on the wetlands of the Western Cape

Helen Dallas, Colleen Seymour, Kate Snadden & Justine Ewart Smith. January 2006. "Identification and collation of existing information on the wetlands of the Western Cape". Freshwater Consulting Group, UCT. Prepared for: The Table Mountain Fund of WWF-South Africa. 112 pp.

http://196.21.45.151/devBGIS/wcwd/Wetlands_Inventory_Review.pdf (accessed Aug 2016)

The report attempts to identify and collate all initiatives and available information regarding the location, character, condition and management of wetlands in the Western Cape. Some of the objectives of the paper include:

- Identifying current national and regional initiatives in wetlands research and conservation management
- Develop generic field datasheets for the collection of wetlands data

e) State of Rivers Report

River Health Programme. 2005. "State of Rivers Report: Greater Cape Town's Rivers". Department of Water Affairs and Forestry, Pretoria. ISBN No: 0-620-34026-6. 56pp.

http://soer.deat.gov.za/dm_documents/greaterCapeTown_05_lxjlG.pdf (accessed Aug 2016)

- The goals of this paper are to assess the biological and habitat integrity of rivers
- This assessment aims to facilitate reports on the ecological state of river systems including wetlands
- It provides reliable information for environmental decision makers

f) The costs and benefits of urban river and wetland rehabilitation

Van Zyl, H., Leman, A. & Jansen, A. 2004. "The costs and benefits of urban river and wetland rehabilitation projects with specific reference to their implications for municipal finance: case studies in Cape Town". Report to Water Research Commission. ISBN No.: 1-77005-274-7. 45 pp.

http://www.wrc.org.za/Knowledge%20Hub%20Documents/Research%20Reports/KV-159-04.pdf (accessed Aug 2016)

This study provides more specific information on the costs and particularly the benefits associated with rehabilitation of 'water environments' on property prices in their vicinity and alternative sources of funding for it. After consultation with the City of Cape Town, three cost benefit case studies were selected to evaluate the economics of rehabilitation: the Lower Silvermine River upgrade, the Kuils River canalisation and rehabilitation, and the Westlake River rehabilitation in Kirstenhof.

g) River Rehabilitation

King, J.M., Scheepers, A.C.T., Fisher, R.C., Reinecke, M.K. & Smith, L.B. 2003. "River rehabilitation: literature review, case studies and emerging principles". South Africa Report to the Water Research Commission. Freshwater Research Unit, Zoology Department, UCT. 326 pp. ISBN No.: 1-77005-098-1.

http://www.wrc.org.za/Knowledge%20Hub%20Documents/Research%20Reports/1161-1-03.pdf

The project had the following objectives:

- Reviewing the world literature on river rehabilitation
- Completing the river-response studies on three Western Cape rivers where active river management was occurring (Silvermine river is one of the three rivers; covered in detail in section 14)
- Deriving a first draft of geomorphological and ecological principles of river rehabilitation

The report mentions two further studies focusing on Silvermine river:

- Anna Cubison (University of Newcastle, England) completed a B.Sc (Hons.) thesis on the Silvermine River: "Comparison of the social and economic impacts of river rehabilitation in Britain (using the example of the River Dearne) with a South African river rehabilitation project."
- Edward Akunji (UCT) completed a B.Sc. (Hons.) thesis on a topic guided by the Silvermine River study.

h) "Developing a classification system for Western Cape Wetlands"

Jones, M.G.W. 2002. "Developing a classification system for Western Cape Wetlands". MSc Thesis, Department of Biological Sciences, University of Cape Town. Unpublished. 145 pp

https://open.uct.ac.za/handle/11427/6107 (accessed Aug 2016)

Abstract:

Although broad wetland classifications systems are available internationally, a comprehensive wetland classification system, which can be used for both desktop and field analyses, was lacking in South Africa but is required by the South African National Water Act (36 of 1998). Wetlands within the Western Cape were selected from different bioregions and wetland regions. In this project geomorphological characteristics (drainage patterns, landform), hydrological pattern and timing of water availability, were recorded during winter and summer for each studied wetland. Water samples were also collected at the wetlands and analysed for ion and nutrient concentrations and samples of organisms were collected for identification. Multivariate cluster and multidimentional scaling analyses of the chemical and biotic data were used to aid identification of wetland groups. A hierarchical classification system was developed using drainage patterns as the primary defining characteristic, followed by wetland landform and hydrological regime as the secondary and tertiary characteristics for identifying wetlands.

3) Botany (Zoology)

a) Wetland plant communities

Ramjukadh, C. 2014. "Are wetland plant communities in the Cape Flora influenced by environmental and land use changes?" Msc Thesis. Department of Biological Science. University of Cape Town. Unpublished.

http://open.uct.ac.za/handle/11427/12974 (accessed Aug 2016)

Abstract:

Considerable attention has been given over the past few years to the distribution and environmental condition of wetlands in South Africa. A 1987-1989 study investigated over one hundred wetlands to establish unique discernible features for grouping and classifying wetlands in the Cape Floristic Region. In the current study, a representative subset of the wetlands surveyed in 1988/89 was re-examined. This thesis characterizes and assesses wetland plant communities and wetland types in both data sets, attempts to identify the major environmental factors influencing plant species distribution in the wetlands, assesses changes in plant species community composition over time; and asks whether surrounding land-use has influenced these. In the current study, of the 142 plants species recorded, 114 were identified to species with 28 to genus level. The historical vegetation data includes 173 plants, of which 115 were identified to species with 58 to genus level.

b) Pushing the boundaries

Nortje, G. 2013. "Pushing the boundaries: Virgilia oroboides (Keurboom) facilitated expansion of forest into fynbos". Bsoc Honours. Department of Biological Sciences. University of Cape Town. Unpublished.

http://open.uct.ac.za/handle/11427/14024?show=full (accessed Aug 2016)

Abstract:

The boundary between forest and fynbos vegetation in the Southern Cape of South Africa presents a dynamic ecotone in which forest has previously been noted to have expanded into fynbos territory. Forest colonization of fynbos has been shown to be primarily a function of nutrients and light environments in the understory which may or may not be conducive for the growth of forest species. Additionally, it is understood that fire regime is the primary agent in determining forest/fynbos boundaries. Virgilia oroboides is a fast-growing leguminous tree confined to the margin between forest and fynbos. It has long been thought to facilitate the growth of forest species through the heavy shading and nutrient enrichment of soils; both of which facilitate the growth of forest seedlings. Furthermore, V. oroboides is predicted to reduce fuel loads and as a result prevent fire penetration of forests.

These possible functions were tested by sampling soils, nutrient content of leaves and the shade cast by plants 18 months after a burn on a forest margin near Swellendam, Southern Cape. In addition, the effects of varying density of Virgilia on surrogates for fuel biomass, and forest seedling growth, were observed at Silvermine on the Cape Peninsula.

Shaded environments produced by V. oroboides are shown to have detrimental effects on the growth of fynbos, while facilitating the growth of forests. V. oroboides had the highest soil nutrient enrichment potential of all species investigated and is therefore predicted to produce nutrient cycling processes conducive to the growth and regeneration of forests. Estimates of fuel in the understory of V. oroboides are predicted to reduce fynbos fire severity upon reaching the margin. These results suggest that Virgilia does indeed facilitate forest tree species more than light-demanding fynbos species so that its presence should result in greater stability or slow expansion of forests into fynbos. If supported by further work, this facilitative role of Virgilia has management implications for the conservation of fynbos and forests in the Southern Cape of South Africa.

c) Spontaneous succession of riparian vegetation and aquatic macroinvertebrates

Reinecke, M.K. 2008. "Spontaneous succession of riparian vegetation and aquatic macroinvertebrates along the Silvermine River, South Africa, after fire and clearing of exotic plant species." MSc Thesis. Department of Biological Sciences. University of Cape Town.

http://open.uct.ac.za/handle/11427/6171?show=full (accessed Aug 2016)

Abstract:

Spontaneous succession, as a method to restore degraded riverine habitats, was assessed for three different components of the Silvermine River ecosystem over one year. These were the state of the physical habitats (biotopes) available to aquatic organisms, changes in the community composition of riparian vegetation, and changes to aquatic macroinvertebrate assemblages present in the river. Data were collected during two successive summer-sampling periods (200I and 2002) at three study sites along the river. Site I was situated in the mountain stream zone, while Sites 2 and 3 were situated in the foothills. Changes in the riverine ecosystem and its associated habitats were compared to reference condition data for each of the three components from each study site.

There were no large changes to the macro-channel banks of the river over the one year study, other than where a meander cut-off occurred at Site 2. Changes over the year in the proportions of flow at the three sites revealed a lack of faster-flow types, which would normally characterise mountain stream and foothill reaches, at all three study sites. Measurements of the proportions of substratum types at the three sites revealed there was an unusually high proportion of fine substratum types present. In the foothills, this was attributed to erosion of the unstable bank at Site 2, which continued to deposit an excess of fine sediment that was transported downstream.

In the vegetation study, most species that came to dominate the mountain stream (Site I) and the foothill (Sites 2 and 3) riparian communities emerged from the seed bank within the first two years after the fire. Thus, using the presence or absence of characteristic riparian vegetation species it is possible to determine whether there is a need to augment the recovery process after two years.

The aquatic macroinvertebrate communities of the mountain stream differed clearly from those in the foothill. The differences were attributed to a combination of the channel type and the longitudinal position of the sites along the river, both of which dictated the physical habitats available. There were clear differences in the potential for recovery at each of the three study sites.

It was shown that non-intervention will not support successful recovery in the short to medium term for any of the measured three components of this river. A blanket policy of non-intervention cannot address site-specific differences, be they natural or artificial, which pose different challenges to restoration. There were zonal differences in the availability of substrata and flow types. There were also other differences that were attributed to water abstraction and the presence of different woody exotic trees. Recovery of the mountain stream was being hampered by the presence of the reservoir and the history of water abstraction while recovery of the foothill was being retarded by erosion from the massive sediment deposit at Site 2. Plans to restore the river, that took into account these inter-site differences, were proposed.

d) (Brady)rhizobium symbiotic relationship with Fabaceae

Marumo, M. 1996. "Ecology of the (Brady)rhizobium symbiotic relationship with Fabaceae in the South-Western Cape". Msc Thesis. Department of Botany. University of Cape Town. Unpublished.

http://open.uct.ac.za/handle/11427/10900 (accessed Aug 2016)

Abstract:

The mediterranean ecosystems of the south-western Cape, South Africa occur mainly on nutrient-poor acid sands and less often on limestone and mixed limestone soil types which support a high species diversity of Fabaceae. This species richness and diversity is suggested to be a result of a high incidence of microsymbiont/host specificity among the fynbos Fabaceae (Cowling et al. 1990); this hypothesis ignored other factors which may possibly play a major role in microsymbiont/host relationships in the Cape Floristic Region, such as soil conditions, and bacterial strain competition which may also influence patterns of nodulation in the region. Cowling et al.'s hypothesis was speculative and was without any experimental basis.

In this thesis, investigations were carried out to assess the applicability of this hypothesis to fynbos, while at the same time other factors that could affect the microsymbiont/host relationship in fynbos were investigated. In order to test Cowling et al.'s hypothesis, various complementary methods were used to assess the nodulation patterns of several indigenous fynbos species. Extracts from a range of soils differing in chemical and physical properties were used to inoculate test species, and their nodulation parameters observed. However, a second more specific approach was used to confirm the results of the previous study. This method involved cross-inoculation of indigenous test species used in the previous study with nodule homogenates prepared from other fynbos species originating from various sites within the Cape Floristic Region.

Silvermine was one of four study sites in this study.

e) Ecological aspects pertaining to a Leucadendron laureolum

Kathan, L. 1981. "A study of certain ecological aspects pertaining to a Leucadendron laureolum community at the Silver Mine Nature Reserve, South Africa." Msc Thesis. Department of Botany. University of Cape Town. Unpublished. 119 pp.

http://open.uct.ac.za/handle/11427/18484 (accessed Aug 2016)

Abstract:

This survey was conducted in three phases:

1. The Braun-Blanquet phytosociological technique was used to describe the vegetation of the study area and adjacent areas. Two major communities, based on plant community structure environmental factors and floristics, are recognised.

2. A determination of phytomass was obtained from five sites in the study area by means of clip-plots from a plant community of post-fire ages of about twenty years, ten years and one year. In this study three structural elements of the fynbos were distinguished viz. proteoid, restioid and "remainder". It was established that the average growth rate for the approximately 20 year old proteoid community was 656 kg/ha/yr and for the ten year old community it was 309,2 kg/ha/yr. The marked difference in growth rate of the proteoid element is due to a slow growth rate until the community is some ten years old and thereafter there is a rapid increase in growth. The restioid component tended to show a decrease in phytomass with increasing age viz. 225; 123,4 and 207,3 kg/ha respectively for one year, ten and approximately twenty year post-fire ages. For the "remainder" it was found that this also decreased with increasing age viz. 380; 54,5 and 25,5 kg/ha for one year, ten and approximately twenty year post fire ages.

3. The effect of the June fire on the bush-cut vegetation of the study area in the Silver Mine Nature Reserve is discussed. The regeneration of plant species was monitored for twelve months in five randomly selected, permanently marked plots. Field observation revealed that 65,1% of the species regenerated from underground organs, such as rhizomes and corms, and the remaining 34,9% of the plant species regenerated from seed. Based on the phytomass study and rate of regeneration of the plant species in the area it appears that an approximate 15 year fire interval is the most acceptable.

Client:
City of Cape Town

Environmental Assessment Practitioner:
Doug Jeffery Environmental Consultants (Pty) Ltd

Implications for freshwater ecosystems of the installation and long term impacts of a proposed underground electrical cable, in Clovelly, City of Cape Town

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DRAFT REPORT FOR COMMENT

April 2012

Report Prepared by:

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EXECUTIVE SUMMARY

The City of Cape Town plans to upgrade an existing 11.6kV electrical cable between Clovelly and Dido Valley, in the South Peninsula area of the City of Cape Town. A section of the proposed cable route would need to cross through an area of natural vegetation, as well as the Silvermine River and its associated wetlands. Since the proposed cable alignment triggers a Basic Assessment in accordance with the National Environment Management Act (NEMA) (Act 107 of 1998), Doug Jeffery Environmental Consultants (Pty) Ltd were appointed by the City of Cape Town to act as the independent Environmental Assessment Practitioners in the Basic Assessment process.

Freshwater Consulting cc (t/a The Freshwater Consulting Group / FCG) were in turn appointed by Doug Jeffery Environmental Consultants (Pty) Ltd to carry out a specialist assessment of the implications of the proposed project for freshwater ecosystems - specifically, for the Silvermine River and its associated wetlands. FCG's study was however conducted after initial input from the project specialist botanists, and the cable alignment assessed in this report reflects the end-point of an iterative process, engaged in with a view to mitigating against significant botanical impacts. As a result, the proposed project in its present form was found to be associated with relatively few concerns in terms of its impacts to wetlands.

Potential impacts to the Silvermine River and its associated wetlands that have been identified by FCG are considered readily mitigable, and the mitigation measures recommended are, for the most part, best practice measures that, in many cases, would probably form part of the contractor's standard approach in any case.

Minor re-alignment has been recommended, in the vicinity of the northern crossing of the low flow channel, to avoid an existing stormwater outlet into the system. For the rest, mitigation measures centre on minimising the extent of disturbance through strict controls during construction and rehabilitation of disturbed areas after construction. The timing of construction is considered an important aspect of disturbance mitigation, and it is important that project planning should take cognisance of the need for construction to take place outside of the wet season.

The Freshwater Consulting Group

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16 April 2012

DECLARATION OF INDEPENDENCE AND EXPERTISE IN THE FIELD OF STUDY

I, Elizabeth (Liz) Day as a partner of Freshwater Consulting cc (t/a The Freshwater Consulting Group / FCG), hereby confirm my independence as a specialist and declare that I do not have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Doug Jeffery Environmental Consultants (Pty) Ltd was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for work performed, specifically in connection with the Basic Assessment for the proposed upgrading of the underground electrical cable, Clovelly, Cape Town.

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Full Name: Elizabeth Day
Freshwater Consulting Group
lizday@mweb.co.za

Title / Position: Dr
Qualification(s): BA, BSc, BSc Hons, PhD
Experience: 17 years in freshwater ecosystems, specialising in urban wetlands and watercourses, with particularly in the City of Cape Town.
Liz has undertaken previous delineations of the Silvermine wetland in the study area, and is familiar with the Silvermine River and the flood attenuation system in which the present project is located.
Registration(s): Member of IAIA; Member of SAIEES; Registered Professional Natural Scientist by SACNASP (Reg No 400270/08) for fields of Biological Science, Ecological Science and Zoological Science

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

The City of Cape Town plans to upgrade an existing 11.6kV electrical cable between Clovelly and Dido Valley, in the South Peninsula area of the City of Cape Town. A section of the proposed cable route would need to cross through an area of natural vegetation, as well as the Silvermine River and its associated wetlands. Since the proposed cable alignment triggers a Basic Assessment in accordance with the National Environment Management Act (NEMA) (Act 107 of 1998), Doug Jeffery Environmental Consultants (Pty) Ltd were appointed by the City of Cape Town to act as the independent Environmental Assessment Practitioners in the Basic Assessment process.

Freshwater Consulting cc (t/a The Freshwater Consulting Group / FCG) were in turn appointed by Doug Jeffery Environmental Consultants (Pty) Ltd to carry out a specialist assessment of the implications of the proposed project for freshwater ecosystems - specifically, for the Silvermine River and its associated wetlands.

1.2 Terms of reference

FCG's terms of reference for this study required that the specialist should undertake the following activities:

- Describe the Silvermine River and associated wetlands in the vicinity of the cable alignment and address the potential impacts of the proposed activity;
- Compile an assessment report to be used in the Basic Assessment Report that will highlight concerns and benefits (if any) and make recommendations regarding mitigation measures required;
- Provide specific management and monitoring requirements, to be used as the basis of conditions for the Environmental Authorisation (should it be granted) and subsequent Environmental Management Programme.

1.3 Activities carried out as part of this project

This report was informed by the following activities:

- Assessment of the site in the context of the City of Cape Town's 2009 wetland GIS layer and previous delineations carried out by Day (2009);
- A site visit, during which the proposed cable alignment was walked, the mapped wetland extent on the southern side of the wetland was adjusted on the basis of ground-truthing, and wetlands and /or river systems within its proximity were noted, and their locations marked with a handheld GPS;
- Liaison with the project design engineers, through Doug Jeffery Environmental Consultants (Pty) Ltd.

1.4 Limitations of this report

This report is subject to the following limitations and or assumptions:

- Comments on the proposed cable alignment included in this report have been made on the basis of a relatively coarse-scale engineering diagram only. Details as to the exact alignment (e.g. which side of the bridge / pathways it would run along) were not available at the time of writing this report. As a result, this report has made some assumptions about the

alignment (see Section 2), and these need to be verified by the project engineers.

- A hand-held GPS, subject to inaccuracies of up to 10m, was used to demarcate spot-points of interest along the proposed alignment or in its vicinity. Note however that aerial photography was also used to interpret GPS points, and the spot locations in fact aligned well with visible cues on the aerial photographs.
- This report deals only with the implications of the proposed electrical cable in the vicinity of the Silvermine River and its wetlands. No other portions of the cable alignment have been assessed.
- Only a portion of the extent of mapped wetland shown in the City's GIS layer was adjusted on the basis of ground-truthing – the entire Silvermine wetland was not re-delineated.
- Finally, this study did not allow for the collection of water quality or soil data, with which to characterise the affected wetlands – such information was not considered likely to contribute meaningfully to addressing the challenges posed by the present project. Information regarding plant community composition and the presence of rare or endangered species in the wetlands has been provided in the specialist botanical assessment for this project (Emmis and Mc Donald 2012).

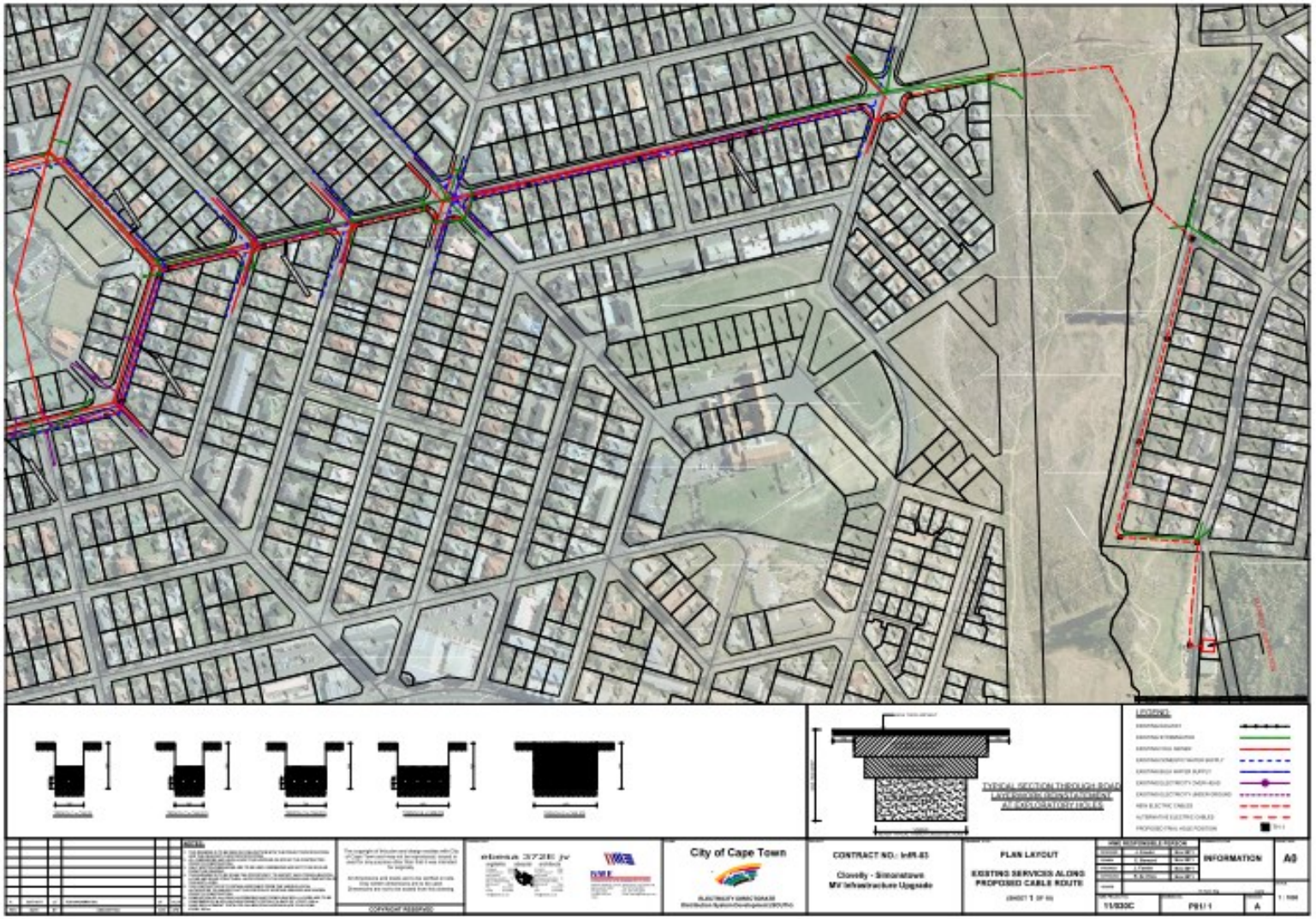

Figure 1 **Proposed alignment of the Clovelly electrical cable (red lines), including the portion through the Silvermine wetlands, as shown in more detail in Figures 2 and 3. Figure courtesy NWE Engineers.**

2 DESCRIPTION OF THE PROPOSED ACTIVITIES

Figure 1 shows the approximate alignment of the proposed electrical cable, as prepared by the project engineers after consideration of various concerns raised in the specialist botanist's report (Emms and Mc Donald 2012). Figures 2 and 3 show the alignment of the cable, in relation to the Silvermine River and associated wetlands, as shown in the City of Cape Town (2009) GIS layer. The latter figures show only those sections of the cable alignment that are addressed in this report, with sections of the cable that do not pass through or adjacent to any freshwater ecosystems or other natural areas of ecological significance falling outside of the terms of reference of this report.

The southern extent of the assessed portion of the proposed cable alignment would run along one of the verges of Disa Road, approaching the right hand bank of the Silvermine River and wetland (by convention, the right hand as seen when facing downstream) along a narrow pedestrian pathway, which runs between a line of houses and an undeveloped erf. The cable route would follow the pathway, crossing onto the wetland edge. Pedestrian crossing of the river and perennially wetted portion of the wetland in this area is accommodated by means of a wooden bridge and boardwalk, and the proposed cable would be passed across this section within ducts installed under the boardwalk.

On the northern side of the main wetland shown in Figure 1, the proposed cable alignment would initially be routed along the existing boardwalk, which swings sharply eastward at this point. The boardwalk gives way to a laterite pathway some 43 m further on, and in the vicinity of this area, the cable would be routed in a north-easterly direction, crossing through an area of natural vegetation and reaching Hilton Road in the vicinity of its intersection with Mountain Steps Road. The cable alignment originally proposed for this area passed through patches of largely undisturbed vegetation, identified by the botanical study as "seepage areas" within a duneslack area. The alignment shown in Figures 1 and 2 has been adjusted by the project engineers in response to recommendations by the botanical specialists to avoid these areas (Emms and McDonald 2012).

From Hilton Road, the proposed cable would be routed in a south easterly direction, along Hilton Road itself. The alignment details available at the time of this report do not specify which side of the road the cable would be routed along, but the engineering plan does indicate that the recommendations of the botanical study have again been taken into account, with the alignment being shifted to Hilton Road, from its original route through dense vegetation within the planted area adjacent to a laterite pedestrian path just south of Hilton Road.

The revised cable alignment in this section passes along Hilton Road as far as the end of the road, and then swings abruptly north-east, crossing the low flow portion of the Silvermine Stream just downstream of the property boundary and then crossing through a disturbed grassed area just south of Clovelly Road. The cable would cross beneath Clovelly Road in this area, and pass into the Clovelly sub-station, as shown in Figure 1.

With the exception of the section of the cable that would be attached to the wooden footbridge on the southern side of the Siilvermine River and wetlands, abutting Disa Road (described above), installation of the proposed cable would entail the following activities (emailed comments from Mr J. Fowler (NWE Engineers) to C. Geyser (Doug Jeffery Environmental Consultants):

- Excavation of a trench, of 0.8 m in depth and 1.0 m in width, with a maximum disturbance area of 2.5 m during excavation;
- Backfilling of the trench with excavated material, following installation of the cable; in the event that excavated material is “unsuitable”, sandbags filled with clean sand would be used to backfill the trench.

In the vicinity of the northern river crossing, abutting Clovelly Road, it is envisaged that trenchless technology would be used to cross the river, with the cable being passed beneath the river within a “sleeve”, cored beneath the river bed. The sleeve would be installed by means of a rig, which would be positioned outside of the river / wetland edge.

Figure 2 **2010 aerial photograph showing the proposed alignment of the electrical cable, in its extent through the Silvermine River and its associated wetlands only. Wetland extent shown as green polygons, as mapped by the City of Cape Town' (2009) GIS layer. Low flow channel of the Silvermine River shown as blue line.**

Figure 3 **2010 aerial photograph (as in Figure 2) showing wetland extent as per the City's (2009 GIS layer) (unfilled green polygon); river channel (blue line), spot locations (numbered green circles) showing positions of the depressional wetlands (referred to as hillslope seeps in Emms and McDonald (2012) and with dotted green line in the vicinity of the pedestrian bridge showing the revised wetland edge in this area, based on Day (2009)'s delineation in this area and ground-truthing in 2012. .**

3 DESCRIPTION OF WETLANDS ON AND ADJACENT TO THE PROPOSED CLOVELLY ELECTRICAL CABLE ALIGNMENT

3.1 The Silvermine River[1]

The Silvermine River rises in the Table Mountain National Park as a series of broad seeps on the upper slopes of the Constantiaberg. From here, it flows down the south eastern slopes of the mountain and through the Fish Hoek Valley as a small perennial stream. In its upper reaches, it is impounded by the Silvermine Dam. A long history of abstraction from the river is reflected in historical abstraction points in the reaches immediately downstream of the dam, which continue to convey water from the stream along a pipeline, formerly used to supply water to areas on the northern slopes of the mountain.

Further downstream, the stream course passes into the residential area of Fish Hoek, flowing through the Clovelly Golf course, towards its outlet into False Bay at the northern end of Fishhoek Beach, at Clovelly. Prior to 1999, the lower reaches of the Silvermine River in this area, which includes the area across which the proposed electrical cable would be routed, had been impacted by extensive infilling of its floodplain, channelisation and invasion by alien vegetation (Day and Ractliffe 2002). In 1998, approval was given as part of the Fishhoek Northern Area Replanning Implementation Plan (Gibb Africa 1998) for the "reconstruction" of the lower reaches of the river, with the major objectives being to implement flood control measures to alleviate the flooding of properties in Clovelly and Fishhoek town, as well as to enhance ecological functioning of the river in its lower reaches, through the re-establishment of wetlands within its floodplain. As a result of implementation of these measures, which took place between 1998 and 2002 (Day and Ractliffe 2002), a broad wetland / flood detention area was created, designed as multi-stage terraces, separated by gabion weirs, which largely control the vertical fall along the river length in the wetlands. These structures allow the spread of high flows, and the inundation of seasonal wetland areas, created by extensive landscaping and planting, while low flows are passed along the northern edge of the wetland, within a confined channel.

The river itself in these reaches passes as a single, shallow channel across the wetland, passing under the wooden pedestrian bridge that crosses the wetland between Disa Avenue and Hilton Road (Figures 2 and 3). Near Hilton Road, the low flow channel of the river is diverted north of the row of houses on the northern side of Hilton Road, where it flows as a narrow, confined channel, stabilised in places with gabions, with floodflows passing over the extensive attenuation wetlands to the south. The low flow channel passes back into the main wetland / open space body downstream of Carlton Road. The proposed point at which the cable would be passed across the channel in a "sleeve" (see Section 2) corresponds with the area just downstream of Carlton Road, where the low flow channel runs as a shallow, reed-lined channel along the outer, northern edge of the open space system. A short distance downstream, the channel is crossed by a second pedestrian bridge, and thereafter enters the main wetland body, passing over a stepped gabion into a wide open water wetland, excavated into the water table and thus permanently inundated. Expansion of *Phragmites australis, Typha capensis* and *Schoenoplectus littoralis* reedbed in this area has increased

[1] Background information adapted from Day and Clark (2012- in prep)

dramatically over the past five years, presumably in response to increasing siltation of the wetlands, and to prolonged periods of shallow inundation, suitable for reedbed establishment (pers. obs.).

The river opens onto the beach just downstream of this pooled area, via a relatively narrow culvert under Main Road, and forms a shallow seasonal lagoon behind a sand bar on the beach.

3.2 River and wetland importance

Despite its status as an artificial wetland, this system has been accorded CBA1 (that is, "Critical Biodiversity Area, Category 1") status in the City of Cape Town's (2009) wetland prioritisation layer (Snaddon and Day 2009). CBA1 status is accorded to wetlands in the top quartile of all wetlands of a similar type, within the City of Cape Town, and highlights wetlands of the highest priority from a biodiversity perspective (Snaddon and Day 2009). In the case of the flood attenuation wetlands created in the lower reaches of the river, the high conservation status of the wetlands (CBA1) was driven largely by the utilisation of the wetlands as breeding areas by the endangered Western Leopard Toad (Day and Clark (2012 in prep.).

3.3 Description of wetlands affected by the proposed cable alignment

The proposed electrical cable would be routed across the lower reaches of the Silvermine River, and its associated wetlands, as described in Section 2. Four different areas and/or types of wetland habitat can be distinguished along the proposed alignment. These are described briefly below, and the actual impacts likely to be associated with the proposed cable alignment through these areas are described in Section 4. The identified wetland types / areas comprise:

- The permanently inundated to saturated portion of the Silvermine River itself, where it passes beneath the wooden pedestrian bridge linked to Disa Avenue, including its seasonally moist to permanently saturated wetland margins on either side of the permanent wetland (Photos A and B, below, and waypoints 14 to 15 in Emms and McDonald 2012): Day (2009) delineated these wetland margins, describing them as a clearly defined band of permanently saturated, seasonally shallowly-inundated wetland, dominated by (dwarf) *Elegia tectorum*, *Ficinia nodosa* (on

Photo A
Southern margins of wetland at pedestrian bridge near Disa Avenue

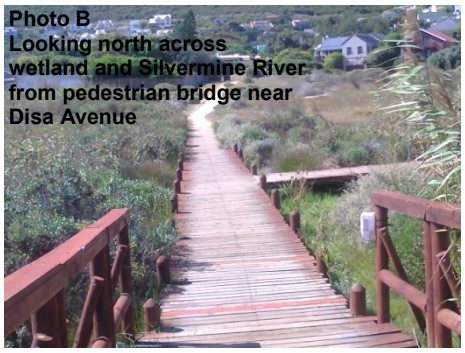

Photo B
Looking north across wetland and Silvermine River from pedestrian bridge near Disa Avenue

slightly elevated margins and nodes) and, in places, *Carex* spp. In places, *Phragmites australis* also occupied this zone, forming dense but relatively discrete stands along the permanent wetland edge. On the left hand (northern) side of the permanent wetland, dense stands of *Cyperus textilis* and *Senecio halimifolius* occur within a mosaic of *Stenotaphrum secundatum* (Buffalo Grass) / *Ficinia nodosa* clumps.

- The isolated depressional wetlands that occur in a terrestrial duneslack mosaic to the north of the main Silvermine wetland / river system, just south of Hilton Road (waypoints 1 to 3 in Figure 3): These wetlands correspond to the "seepage" wetlands described by Emms and McDonald (2012) but are in fact classified in terms of the National Wetland Classification System (SANBI 2009) as (duneslack) depressions, within a Plain setting. The wettest portions of the depressions are dominated by sparse to dense patches of *Ficinia nodosa* and sparse *Mariscus thunbergii*, both of which are considered indicative of wetland conditions (Photo C).

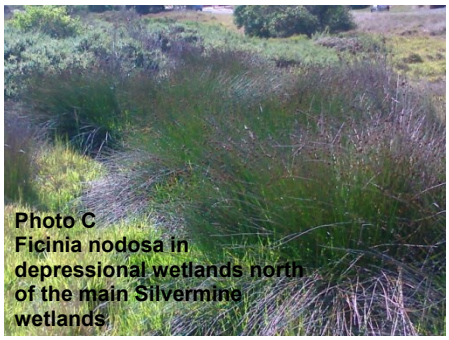

Photo C
Ficinia nodosa in depressional wetlands north of the main Silvermine wetlands

- The low flow channel of the Silvermine River immediately downstream of Hilton Road, in the area in which the proposed cable would cross through the stream: the channel in these reaches is narrow and relatively steep-sided, and conveys only low flows from the Silvermine River, with flood flows being dissipated into the main seasonal wetland area to the south. The channel is lined with dense stands of *Phragmites australis*, which give way to *Senecio halimifolius* on the upper bank. The invasive alien weed *Sesbania punicea* is abundant along the upper stream bank, including in the vicinity of the proposed stream crossing, which appears to lie in close proximity to a stormwater outlet into the left hand river bank.

It is likely that some of the above species were introduced to the wetland during the reconstruction of the floodplain – their survival and spread in the area suggests however that conditions here are suitable for their persistence.

4 IMPLICATIONS OF THE PROPOSED CABLE FOR FRESHWATER ECOSYSTEMS

4.1 Overview

The present study was conducted after initial input from the project specialist botanists, and the cable alignment assessed here reflects the end-point of an iterative process, engaged in with a view to mitigating against significant botanical impacts. Since there is considerable overlap between the botanical study and the freshwater ecosystem study in this particular project, it is not surprising that many of the concerns raised in the former would also apply to the latter, and that a least-impacting outcome from a botanical perspective is likely to be compatible with a least-impacting outcome from a freshwater ecosystems perspective. As a result, the proposed project in its present form is likely to be associated with relatively few concerns in terms of its impacts to wetlands. Those that persist are discussed in more detail in the sections below. In some cases, uncertainty about the exact alignment of the cableway means that a conservative approach has had to be taken in assuming a worst case scenario – it is acknowledged that this is not necessarily a reflection of the actual approach that would be taken.

4.2 Implications of design and layout

The most important changes in cable alignment have already been addressed by the botanical specialist study for this project, resulting in the amended alignment presenting few problems from a freshwater ecosystems perspective either.

The most significant issue raised by FCG prior to compilation of this report was the proposed passage of the cable across the low flow channel of the Silvermine River, rather than attaching it to the existing pedestrian bridge just downstream of the proposed crossing point. This mitigation measure, which would have significantly decreased the net impact of the project for freshwater ecosystems, is not however considered feasible from a technical perspective, given the number of existing services that already cross over at the bridge (email: C. Geyser (Doug Jeffery Environmental Consultants to Liz Day, reflecting comments from the project engineers). As a result, the impact of channel disturbance is dealt with instead in Section 4.3. It is however recommended that the current alignment of the cable across the low flow channel should be moved slightly, such that it is located upstream of the existing stormwater pipeline outlet into the channel in this area, to avoid exposure of the cable, particularly immediately following construction, as a result of concentrated stormwater flows into disturbed areas.

Assuming that the current alignment, presented for EIA assessment at a low level of resolution only that did not allow the details of its passage to be ascertained, has accommodated all of the mitigation request of the botanical specialists, will attach to the bridge and boardwalks of the southern (main) wetland, if not to the bridge over the northern channel, and will avoid the “seepage” wetlands referred to in Emms and McDonald (2012) and mapped in this report as wetland depressions 1, 2 and 3 (Figure 3), no further changes in alignment are considered necessary from a freshwater ecosystems perspective.

Summaries of the ecological significance of the above impacts with and without implementation of the required mitigation measures are provided in Table 1.

4.3 Implications of construction

4.3.1 Destruction of wetland habitat

Description of the impact

Excavation of a trench, stockpiling of soils and cable material and access by machinery or people along the length of the trench during the installation of the cable is likely to result in any of the following:

- Compaction of wetland areas (e.g. if vehicles drive over wetland areas or if wetlands are used for stockpiling of soils, waste or construction material);
- Trampling of wetland vegetation, resulting in compaction and damage to wetland plants;
- Disturbance to Western Leopard toads during movements to and from their breeding sites in open water pools (September to early December).

The areas most vulnerable to the above kinds of impact comprise:

- The wetland margins on the northern (left hand) and southern (right hand) side of the pedestrian bridge near Disa Avenue;
- The wetland depressions, indicated by spot points 1,2 and 3 in Figure 3 and the low flow channel and its margins in the area south of Clovelly Road, where the proposed cable would cross the stream.

Without implementation of any mitigation measures, and assuming a worst-case approach in which at least some fill is not removed from stock-piled areas, the construction process would potentially result in long-term, negative impacts of a high to medium magnitude, albeit at a local scale, as any additional soil left in wetland areas would effectively result in wetland infilling, resultant changes in habitat type and an increased vulnerability to weeds. Even if it is assumed that all excess spoil is removed from the wetlands after construction, the construction process is still likely to result in impacts of medium magnitude, albeit in the short to medium terms and at a local scale.

Wetland destruction would also be likely in the vicinity of the pedestrian bridge abutting Disa Avenue, even though excavation of wetland soils would not take place in this area. However, trampling of the underlying wetland vegetation during the installation process is likely, and would result in damage to wetland plants and compaction of soils

Recommended mitigation measures

The following mitigation measures are considered essential:

- Construction of sections of the cable alignment that cross either the northern or the southern portions of the main wetland and low flow channels of the Silvermine River should take place outside of the wet season (i.e. between late November and April), when it is unlikely that rainfall damage will result in erosion of excavated areas and downstream sedimentation, and at the end of the Leopard Toad breeding season.
- Wetland depressions shown in spot points 1, 2 and 3 should be identified on site by the wetland ecologist or botanical specialist, and demarcated with danger tape or other temporary marking. These areas should be treated as no-go areas during construction, and vehicles, personnel and building material should not be allowed within their proximity. This means that, where the cable would pass in their close vicinity, allowance should

be made for the stockpiling of excavated material outside of these area, and / or for the manual excavation of the cable trench.

- A maximum disturbance corridor of width 5 m should be measured out along the alignment of the cable and demarcated on both sides on site with danger tape or other effective temporary fencing material. The areas outside of this corridor should be treated as no-go areas during the entire construction process. In the vicinity of the pedestrian bridge and walkway, where access to the wetland would presumably only be required for the purposes of attaching the cable to the boardwalk / bridge structures, the disturbance corridor should be reduced to 2m only, on one side of the structure. Access should preferably be from the top of the boardwalk only, although it is recognised that this measure may not be feasible.
- Manual rather than mechanical excavation of the trench would be required in all of the above-mentioned areas.
- No cables or other construction materials and/or waste should be stored, even temporarily, in wetland areas – all temporary storing of cabling during installation should be in terrestrial sites (agreed upon in discussion with the botanical specialist) or within the demarcated disturbance corridor.
- With the exception of the cable itself, no materials likely to impede or speed up drainage through the wetland should be included in the design of the cable trench – this means that gravels or other materials that would result in rapid drainage from the trench should not be utilised in trench construction, as these will prevent the rehabilitation of the cable corridor following construction.
- After laying of the cable, back-filling of the trench should ensure compaction to pre-construction levels only – further compaction of the trench will affect rehabilitation success.
- Backfilling of the trench should restore pre-construction elevations, and it is stressed that increases in ground level of only 100 mm in a natural wetland can have significant effects on habitat type. This stipulation means that there could well be excess soil remaining after infilling, and allowance should be made for this material to be disposed of off-site, or in disturbed terrestrial areas, identified in collaboration with the botanical specialist.
- Final shaping of the infilled trench surface should be subject to environmental approval, ideally by a wetland specialist, to ensure that the disturbed corridor blends in with habitats on either side.
- Where the trench is passed through the low flow river channel, allowance must be made in setting the levels of the cable for the re-instatement of the stream bank to its present alignment profile.
- Dead or trampled plant material should be cut back, to allow resprouting, where necessary – this activity should be carried out under the supervision of the botanical specialist.
- Allowance should be made for limited planting of disturbed areas, particularly in the vicinity of the low flow channel crossing (northern side of the wetland abutting Clovelly Road); it is anticipated that colonisation of disturbed areas elsewhere would probably take place naturally, if ground compaction and final elevation levels are achieved as stipulated.

- Only locally indigenous plant species, that have been used in the Silvermine Planting Programme already, should be utilised in any replanting activities on the Silvermine River and wetlands in this area.
- A construction phase environmental management programme should be compiled, which includes detailed Method Statements that will ensure that the above mitigation measures can be effectively implemented and the identified impacts can be avoided or minimised as far as possible.
- An Environmental Control Officer should be appointed to the project, to ensure that the objectives of the required mitigation measures are met during project implementation.

Summaries of the ecological significance of the above measures with and without implementation of the required mitigation measures are provided in Table 2.

*4.3.2 Change*s in water quality

Description of the impact

Changes in water quality in the Silvermine wetlands and river are possible during the construction phase, albeit unlikely, given the kind of activities envisaged. Water quality changes are most likely to comprise increased turbidity, resulting from runoff from disturbed, sandy or muddy areas, or from dewatering of trenches. This impact is considered of low magnitude, and low to medium likelihood.

In the event that inadequate toilet and washing facilities are provided for workers during construction, nutrient and bacteriological contamination as well as increased turbidity from the washing of spades and other material in the stream are possible.

Recommended mitigation measures

Mitigation against water quality impacts would be achieved effectively through the following measures which, it is acknowledged, are already likely to be part of the construction team's standard protocol:

- Implementation of the restrictions in timing of construction in the vicinity of wetlands and streams as outlined in Section 4.3.1, when runoff of stockpiled material is least likely and dewatering would be least necessary, given the seasonal drop in water table;
- Passage of any dewatered material into designated infiltration areas, selected in consultation with the wetland ecologist;
- Immediate infilling of the trench after each section of the cable has been laid;
- Provision of adequate toilet and washing facilities for workers and their tools, outside of the wetland / river areas and such that runoff will not pass into these environments.

Summaries of the ecological significance of the above impacts with and without implementation of the required mitigation measures are provided in Table 2.

4.4 Implications of the operational phase

Description of the impact

The operational phase of the electric cable is expected to pose little to no direct threat to wetland ecosystems, other than in the event of malfunction, when it is possible that sections of the cable might be exposed for repair or replacement. In this event, the impacts are likely to be the same as in the construction phase.

Recommended mitigation measures

Construction phase mitigation measures would be recommended in the event that any requirements for excavation of the cable route and/or its re-installation were required.

Table 1 Summary of impacts associated with the layout of the proposed cable

Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Status of the impact	Degree of confidence	Level of significance
Impact: Erosion associated with disturbance of the bank in the vicinity of a stormwater outlet							
Without mitigation	Local	Medium to long term	Medium	Probable	Negative	Medium	Low to Medium
Full mitigation	Local	Short-term	Low to negligible	Unlikely	Negative	Medium	Low to negligible

Table 2 Summary of impacts associated with the construction phase of the cable

Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Status of the impact	Degree of confidence	Level of significance
Impact: Destruction of wetland habitat							
Without mitigation	Local	Medium to long term	Medium to high	Definite to probable	Negative	Medium	Medium
Assuming full mitigation	Local	Short-term	Medium to high	Probable	Negative	Medium	Low
Impact: Changes in water quality							
Without mitigation	Local	Short-term	Low	Possible	Negative	Low	Low
Assuming full mitigation	Local	Short-term	Negligible	Unlikely	Negative	Medium	Low to negligible

5 CONCLUSIONS

Although this study has identified a number of potential impacts to the Silvermine River and its associated wetlands that would be associated with the proposed routing of an electrical cable through this system, the impacts identified are considered readily mitigable, and the mitigation measures recommended are, for the most part, best practice measures that, in many cases, would probably form part of the contractor's standard approach in any case.

Minor re-alignment is recommended, in the vicinity of the northern crossing of the low flow channel, to avoid an existing stormwater outlet into the system. For the rest, mitigation measures centre on minimising the extent of disturbance through strict controls during construction and rehabilitation of disturbed areas after construction. The timing of construction is considered an important aspect of disturbance mitigation, and it is important that project planning take cognisance of the need for construction to take place outside of the wet season.

6 REFERENCES

Day, E. 2009. Determination of the wetland edge and its associated buffer on Erf 7000, Fish Hoek. Report to the City of Cape Town.

Day, E. and Ractliffe, G.R. 2002. Assessment of river and wetland engineering and rehabilitation activities within the City of Cape Town: Realisation of project goals and their ecological implications. Volume Two. Case Study assessments. Report to Catchment Management, CMC Administration

Department of Water Affairs and Forestry (2005). A practical field procedure for identification and delineation of wetland riparian areas. Department of Water Affairs and Forestry, Pretoria, South Africa.

Emms, P. and McDonald, D. 2012. Botanical Assessment for proposed upgrade of an electrical cable, Clovelly, City of Cape Town. Report for Doug Jeffery Environmental Consultants (PTY) Ltd.

Gibb Africa. 1998. Environmental Baseline Report on the Silvermine corridor, Fish Hoek. Input into the Fish Hoek Valley Structure Plan. Project No J19200b.

SANBI. 2009. Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report (Final Draft). Prepared by the Freshwater Consulting Group for the South African National Biodiversity Institute (SANBI).

Snaddon, C. and Day, E. (Liz). 2009. Prioritisation of City Wetlands. Report submitted to The City of Cape Town. Department of Environmental Resource Management.

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24 July 2012

Mr Clinton Geyser
Doug Jeffery Environmental Consultants
Klapmuts

Dear Clinton

Comments on the amended alignment of an electric cable line in Clovelly, Cape Town

Your email of 6 July 2012 refers, in which you provided me with an amended alignment (included here in Figure 1) for the proposed electric cable, which links across the Silvermine wetlands to the existing substation on Clovelly Road.

This letter serves as confirmation that, from a wetland ecosystems perspective, the amended alignment, which runs mainly along existing roads and pathways, would be a markedly preferred alternative to the alignment previously assessed in my specialist Basic Assessment Report (Day 2012). This is because it avoids crossing the northern channel of the Silvermine River and the associated disturbance associated with such activities, as well as avoiding the isolated depressional wetlands that occur in the open space between the northern and southern wetland / channel swathes of the Silvermine system, as described in my previous report. The area of wetland likely to be affected would thus be markedly reduced.

The revised alignment shown in Figure 1 would still cross the southern channel of the Silvermine River, as per the previous alignment alternative, and the same mitigation measures previously outlined would be applicable to this portion of the alignment, namely that:

- Construction of sections of the cable alignment that cross the southern portion of the main wetland and low flow channels of the Silvermine River should take place outside of the wet season (i.e. between late November and April), when it is unlikely that rainfall damage will result in erosion of excavated areas and downstream sedimentation, and at the end of the Leopard Toad breeding season.
- In the vicinity of the pedestrian bridge and walkway, where access to the wetland would presumably only be required for the purposes of attaching the cable to the boardwalk / bridge structures, the disturbance corridor should be limited to 2m only, on one side of the structure. Access should preferably be from the top of the boardwalk only, although it is recognised that this measure may not be feasible.
- Manual rather than mechanical excavation of the trench would be required.
- No cables or other construction materials and/or waste should be stored, even temporarily, in wetland areas – all temporary storing of cabling during installation should be in terrestrial sites (agreed upon in discussion with the botanical specialist) or within the demarcated disturbance corridor.

- With the exception of the cable itself, no materials likely to impede or speed up drainage through the wetland should be included in the design of the cable trench – this means that gravels or other materials that would result in rapid drainage from the trench should not be utilised in trench construction, as these will prevent the rehabilitation of the cable corridor following construction.
- After laying of the cable, back-filling of the trench should ensure compaction to pre-construction levels only – further compaction of the trench will affect rehabilitation success.
- Backfilling of the trench should restore pre-construction elevations, and it is stressed that increases in ground level of only 100 mm in a natural wetland can have significant effects on habitat type. This stipulation means that there could well be excess soil remaining after infilling, and allowance should be made for this material to be disposed of off-site, or in disturbed terrestrial areas, identified in collaboration with the botanical specialist.
- Final shaping of the infilled trench surface should be subject to environmental approval, ideally by a wetland specialist, to ensure that the disturbed corridor blends in with habitats on either side.
- Dead or trampled plant material should be cut back, to allow resprouting, where necessary – this activity should be carried out under the supervision of the botanical specialist.
- Only locally indigenous plant species, that have been used in the Silvermine Planting Programme already, should be utilised in any replanting activities on the Silvermine River and wetlands in this area.
- A construction phase environmental management programme (CEMP) should be compiled, which includes detailed Method Statements that will ensure that the above mitigation measures can be effectively implemented and the identified impacts can be avoided or minimised as far as possible. The CEMP should also outline measures to ensure that, for the length of cable way that crosses the river and open space area:
    - dewatered material passes only into designated infiltration areas, selected in consultation with the wetland ecologist;
    - infilling of the trench in wetland areas takes place immediately after each section of the cable has been laid;
    - Adequate toilet and washing facilities for workers and their tools are provided outside of the wetland / river areas such that runoff will not pass into these environments.
- An Environmental Control Officer should be appointed to the project, to ensure that the objectives of the required mitigation measures are met during project implementation.

Summaries of the ecological significance of the above impacts with and without implementation of the required mitigation measures are provided in Table 1.

Please contact me if there is any additional information that you require.

Yours sincerely

Liz Day

(PhD; Pr Nat Sci)

References

Day, E. (Liz) 2012. Implications for freshwater ecosystems of the installation and long term impacts of a proposed underground electrical cable, in Clovelly, City of Cape Town. Draft Basic Assessment Report to Doug Jeffery Environmental Consultants.

Figure 1 Revised alignment of proposed cable line

Table 1 Summary of impacts associated with the proposed cable – revised alignment

Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Status of the impact	Degree of confidence	Level of significance
Impact: Destruction of wetland habitat							
Without mitigation	Local	Medium to long term	Medium	Definite to probable	Negative	High	Medium
Assuming full mitigation	Local	Short-term	Low to Medium	Probable	Negative	High	Very low
Impact: Changes in water quality							
Without mitigation	Local	Short-term	Low	Possible	Negative	Low	Low
Assuming full mitigation	Local	Short-term	Negligible	Unlikely	Negative	Medium	Low to negligible