



Report to EnviroPro Environmental Consulting (Pty) Ltd on a Preliminary Geotechnical Appraisal carried out for the Mfume Low Level Crossing over the Lovu River between Ndaya and Embothimuni, KwaZulu-Natal

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1. INTRODUCTION

Gondwana Geo Solutions (Pty) Ltd (or GGS) were appointed by EnviroPro Environmental Consulting (Pty) Ltd to carry out a preliminary geotechnical appraisal for the Mfume Low Level Crossing over the Lovu River in the Mfume area of Kwazulu-Natal.

In terms of the scope of works submitted to EnviroPro Environmental Consultants (Pty) Ltd by GGS the preliminary geotechnical assessment deals with the following:

- Geotechnical scoping exercise:
 - Desktop study of all available information pertaining to the site: consultation of available geological maps: regional and local geology
- Visit to site to evaluate the site characteristics, which may include:
 - Geomorphological controls on site development, such as slope factors, rock outcrop, wetlands, other activities, existing earthworks etc
 - A more detailed indication of local geology from available exposures such as road cuttings, rock outcrops and other excavations that may be open for inspection
- Following on the initial site visit, the geotechnical scoping report will report on the findings of the site visit and the desktop study. In essence the report will cover the following issues:
 - Site geology
 - Site stability
 - Excavations
 - Lateral support and Dewatering of excavations
 - Foundations
 - Materials for approach fills, and
 - Recommendations for detailed geotechnical investigations, if required

The scoping exercise was conducted on the 24th July 2019.

2. INFORMATION SUPPLIED

The information supplied by EnviroPro Environmental Consultants (Pty) Ltd:

- Google Map showing the location of the bridge site: Mfume Low Level Crossing.

3. SITE DESCRIPTION

The low level bridge crossing site is situated on the Lovu River between Ndaya in the South and Embothimuni in the North in the Mfume area. The site was accessed by travelling the N2 South, taking the Umgababa offramp and driving towards Mfume, followed by driving northwest to Emgageni, and North towards Ndaya. The site is accessed off of an unnamed dirt road which ends just before reaching the Lovu river channel.

The location of the site is shown in Figure 1.

The low level bridge crossing will allow the gravel road to cross over the Lovu River between the Ndaya side and Embothimuni side. The road on the Ndaya side is a vehicle access route to the surrounding rural houses. This road ends just before the sandy banks of the Lovu River. Other than the coarse alluvial sands on the embankments, abundant gneiss outcrops are found close to the river bank, on both sides of the river, as well as within the river.

Abundant foot paths are found adjacent to the river used by the locals on either side of the Lovu River embankments.

The land is used for both farming of crops (mostly sugar cane) and rural livestock (cattle).

Topographically, there is a relatively steep gradient (20-30°) towards the river from the south along the access road (Plate 2) before becoming gently sloping closer to the sandy river bank on the north of the river channel. On the northern portion of the site the man-made footpath follows descends steeply sloping ground (10-15°) towards the river from the North (Plate 1). The Lovu River channel here is wide albeit shallow.

The vegetation along the southern bank comprises light to moderately dense bush and grasses, becoming denser on the northern side of the river.

It is important to note that at the time of investigation the Lovu River was at a low flow level. The flow will increase significantly during and immediately after the summer rainy season.



Plate 1: Site at the Lovu river showing the current gravel tracks used by pedestrians and cows



Plate 2: View of the South showing gravel access road, and sandy river banks with light to moderate, scattered vegetation



Plate 3: View of the West (upstream) of the Lovu River showing outcropping ridges of gneiss in the river channel as well as at the northern embankment crossing

4. SITE GEOLOGY

The geology of the region according to the 1:250000 3030 Port Shepstone Regional Geological map shows that the Mfume low-level bridge crossing is underlain by the banded gneisses and migmatites of the Mapumulo Metamorphic Suite. The regional geology of the site is shown in Figure 2.

Banded gneisses are shown by abundant outcrop adjacent to the river (Plate 4). These rocks are described as light brownish grey banded dark grey, speckled white and black, slightly to medium weathered, closely to moderately jointed, at least medium hard rock biotite-feldspar GNEISS.

Further inspection along the river bed and within the river showed light grey streaked pink, slightly to medium weathered, moderately jointed, at least medium hard rock quartz-feldspar GNEISS.

Coarse alluvial sands of the “Umgeni” type are present along the river banks overlying the gneiss bedrock.



Plate 4: Gneiss bedrock exhibiting banding along the southern side of the Lovu river close to the existing dirt road. Mapumulo Metamorphic Suite

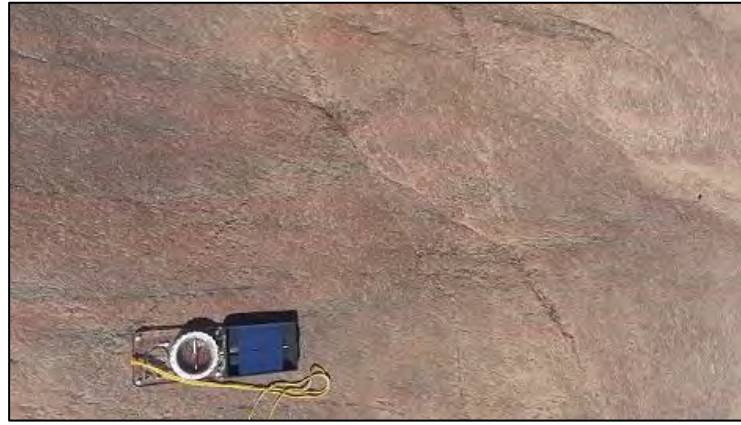


Plate 5: Gneiss bedrock within the Lovu river showing pink micro-banding

5. PRELIMINARY GEOTECHNICAL ASSESSMENT

5.1 Details of Proposed Low Level Crossing

No details of the low level crossing bridge that will be constructed on the site has been provided. However, good founding conditions can be expected within very shallow depths on the gneiss bedrock and the bridge may consist of deck panels simply supported on pier and pad foundations on competent rock.

5.2 General Stability of the Bridge Site

Due to the gentle gradient closer to the river at the site, and the shallow bedrock as well as outcrop, the site is considered stable.

5.3 Bridge Foundations

The bridge supports will be founded on the shallow bedrock. The design of the bridge will dictate where the abutment and pier foundations will be positioned.

All foundations will need to be socketed into the bedrock or fixed to the bedrock with grouted reinforcing dowels drilled into the rock to ensure sufficient fixity of the bridge piers and abutments. The Lovu River is notorious for significant flooding and high debris loads can be expected.

5.4 Excavations and Lateral Support Requirements

The low level bridge crossing over the Lovu River is unlikely to have embankments of any significance although this must be confirmed by the bridge designer.

Where bridge design requires that piers are located in the river bed it may be necessary to keep excavations dry with half-width cofferdam construction and dewatering as dictated by inflows. In any event, construction of the bridge must take place in the dry season.

5.5 Materials for Approach Fills

Subgrade materials occurring at bridge abutments may need to be investigated to confirm their quality and suitability for re-use in the construction of the fill approaches, if this is required.

The materials overlying the rock at this bridge site are identified as predominantly sharp, clean sands of the “Umgeni” type and are likely to be suitable for use as a general fill or subgrade. However, these materials will need to be sampled and tested to confirm materials classification and usage in construction.

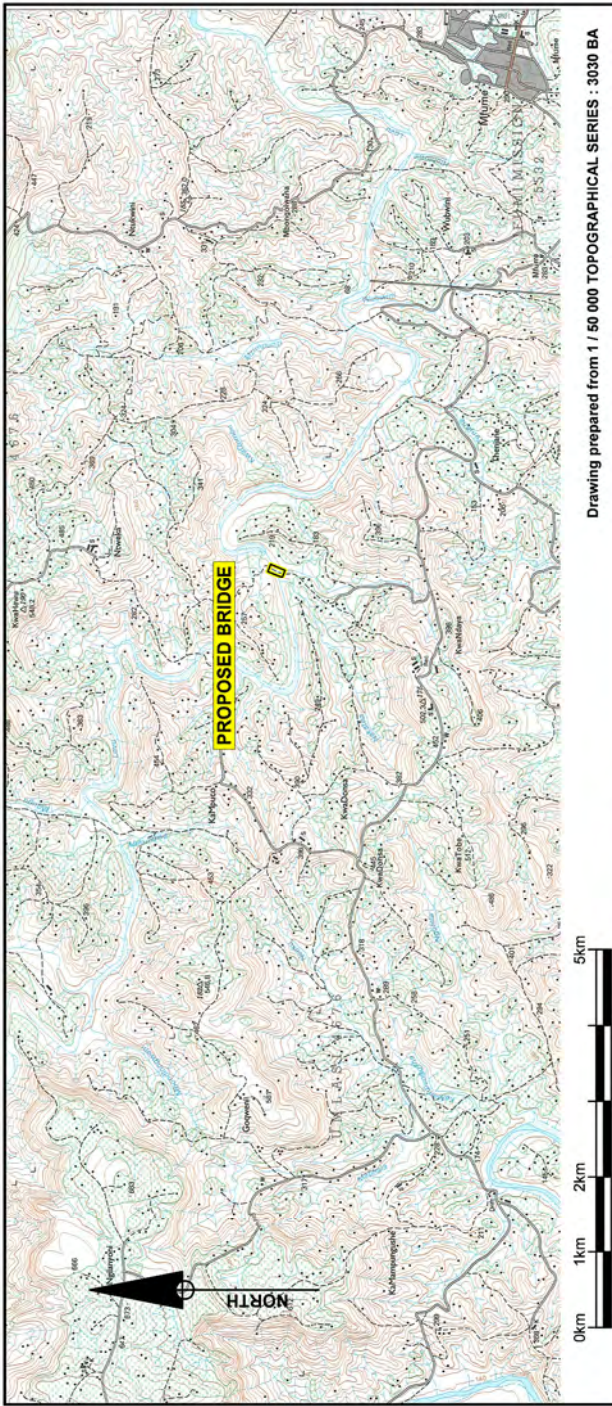
6. CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the preliminary geotechnical assessment will require confirmation by detailed geotechnical investigations conducted at each site. This can only be done once an indication of the bridge support points (abutments and piers) are confirmed.

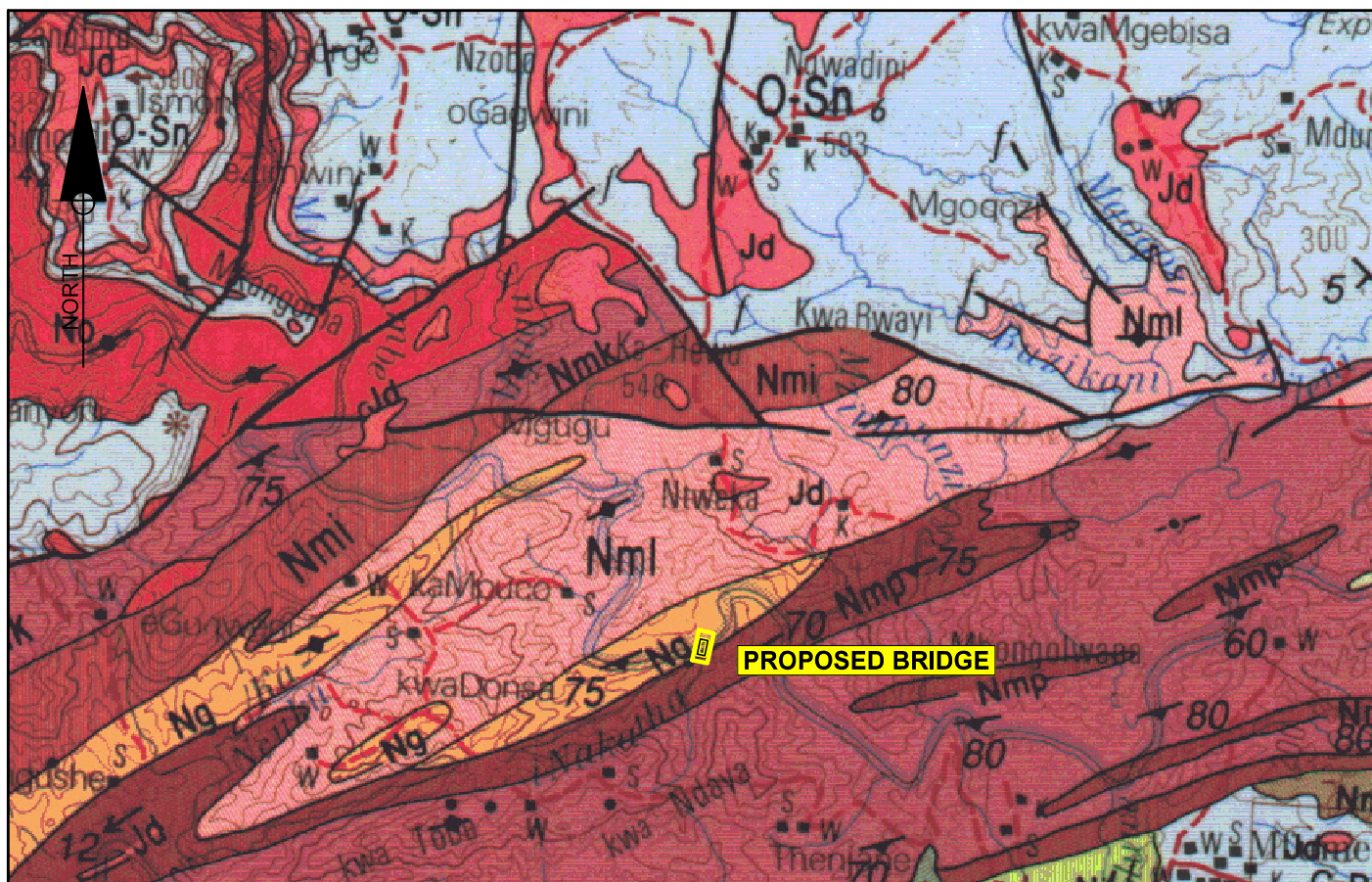
The following geotechnical work is to be required for the Mfume Low level crossing bridge site:

- Test pitting by excavator along river bank and river bed to allow it to be assessed by a geotechnically qualified professional
- Laboratory testing of approach fill material (as required by bridge design) and rock strength tests to allow accurate assessment of bearing capacity

FIGURES



DRAWING DESCRIPTION	Locality Plan	CLIENT PROJECT <
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Graphic Scale
1 / 100 000

NB : Please note that the bar scale supercedes the verbal scale due to print sizes etc.

LEGEND

Jd	Dolerite. Intrusive rock
O-Sn	Red-brown, coarse-to fine-grained arkose, light-grey quartzarenite, micaceous sandstone, grit, conglomerate, subordinate siltstone and mudstone. NATAL GROUP
No	Very coarse-grained porphyritic granite, charnockite. Oribi Gorge Suite
Nmi	Pink, medium-to coarse-grained gneissose granite. MZIMILLO SUITE
Nml	Light pink and grey gneissose garnet leucogranite, migmatite. MARGATE COMPLEX
Ng	streaky pink quartz-feldspar gneiss and migmatite, subordinate amphibolite and calc-silicate rocks. MAPUMULO METAMORPHIC SUITE
Nmk	Garnet-biotite augen-gneiss. Mkomazi Gneiss
Nmp	Banded biotite-garnet-cordierite-sillimanite gneiss and migmatite; subordinate hornblende gneiss, migmatite and granulite. Mpambanyoni Formation. MAPUMULO METAMORPHIC SUITE

Drawing prepared from 1 / 250 000 GEOLOGICAL SERIES : DURBAN 2930

DRAWING DESCRIPTION Locality Plan showing Regional Geology Scale 1 : 100 000 (On A4 Original)	CLIENT ENVIROPRO	DATE 18/07/2019
	PROJECT Desktop Geotechnical Investigation for Proposed Low Level Crossing - Mfume	DRAWN A.S.
		CHECK M.V.R.
		REFERENCE No. 19 - 157
		FIGURE No. 4-2
		REV. 0