HERITAGE IMPACT ASSESSMENT

PROPOSED DR02481 BRIDGE REFURBISHMENT

EASTERN CAPE PROVINCIAL DEPARTMENT OF ROADS

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EXECUTIVE SUMMARY

Due to functional and safety concerns the old stone bridge on the DR02481 located 25.3 kilometres north of Cookhouse is in need of a new carriageway and pedestrian walkways. The bridge is located in the Great Fish River valley which is a cultural heritage landscape and there are a number of old structures within a radius of 2 kilometres of the bridge, although none of these are of high heritage value. The bridge is an old stone arched bridge that is judged to be graded General 3B. There are three alternatives, the only acceptable alternative is to restore the stonework where needed and to construct new concrete carriageway with a pedestrian walkway on top of the old bridge. This will solve the functional and safety issues and architecturally can be clearly read as a contemporary addition on the remaining stone bridge.

This heritage survey was conducted by G McLachlan Architect, Town and Regional Planner and Heritage Practitioner. He holds a B Arch degree from UPE, a MSc (TRP) from Pretoria and a Cert HRM from Rhodes and he is a registered Professional Heritage Practitioner with the Association of Professional Heritage Practitioners. He spent many years practice as an Architect and Town Planner. He also spent 36 years on the staff of the School of Architecture at the NMU including 3 as Ass Professor and Head of Department and 7 as Director of School.

LIST OF FIGURES

1. BACKGROUND AND THE PROPOSED PROJECT:

1.1. BACKGROUND:

1.1.1. The Great Fish River Valley as Cultural Landscape:

The valley of the Great Fish River was originally occupied by the San and Khoi who have left numerous traces of their occupation. The Fish River at one time became the eastern boundary of the Cape Colony and was one of the sites of the approximately one hundred years of frontier conflict between the amaXhosa and the Dutch and British. As such the valley has a particular and important historical connotation in South Africa ("Eastern Cape Wars of Dispossession 1779 – 1878", South African History on Line, sahistory.org.za, 19.11.2019).

The valley has long been a site of hunting and agriculture. Agriculture was always plagued by the dryness of the eastern Karoo and the irregular flow in the river. In 1975, however, the valley was transformed into the fertile farming area that it is today by the completion of the Gariep Fish River Transfer Scheme. This ambitious irrigation scheme which was begun in 1966 resulted in water from the Gariep Dam being fed into the Great Fish River and into the Sundays River (Wikipedia: Orange-Fish River Tunnel, 19.11.2019). As a consequence of this impressive irrigation scheme a highly active and prosperous agricultural industry has developed in the valley. This has resulted in a considerable amount of agricultural traffic (bakkies, tractors, large trucks, etc) that use the roads in and around the valley.

Figure 1: Wheat farming in the Fish River Valley (Photo: The Author)

In the late nineteenth century South Africa's coastal cities all constructed railway lines that connected them to the diamond mines in Kimberly and later to the gold mines and the developing urban cluster on the Witwatersrand. All of this took

place against increasing tensions between the Boer Republics and the British that eventually resulted in the Anglo Boer War of 1899 – 1903. The railway line from Port Elizabeth was commenced in 1874 and reached Cradock on 1 June 1881 (Wikipedia: South African Locomotive History, 15.11.2019). The rail line from Port Elizabeth to Noupoort was electrified in about 1960 and as part of the project the alignment of the line in the part of the Fish River Valley that is the concern of this report was changed. The line was moved approximately half a kilometre to a kilometre eastward. This resulted in the abandonment of the old "Klipfontein" station and the conversion of the affected part of the rail line into part of district road DR02481, and the reuse of a number of old railway bridges as road bridges on the DR02481, including the bridge which is the subject of this report.

The Great Fish River Valley is a rich and complex cultural landscape.

Figure 2: The old Klipfontein Railway Station on the DR02481, now used as a house. (Photo: The Author)

1.1.2. Bridge DR02481:

Bridge DR02481 was originally constructed in a1877 as a bridge on the Port Elizabeth to Cradock main rail line. It spans the watercourse known as the Kariega, a side stream of the Great Fish River. This watercourse is subject to significant flooding in times of heavy rain. With the realignment of the rail line in about 1960 the bridge became part of district road DR02481.

The bridge is an elegant structure built with dressed stone. It consists of two stone clad approaches on either side and a single central arch. The arch has a span of approximately 6m and a height of approximately 8.5m. The walls supporting the arch are slightly battered sloping from approximately 6m at the

springing point of the arch to approximately 5.5m at the base of the walls. The drop from the bridge carriageway to the stream bed below is approximately 10m.

The current use of the bridge as a road bridge is somewhat problematic, and there are a number of factors relating to the current use of the bridge that have led to this present project proposal. These include:

- The structure of the bridge is sound.
- The DR02481 is a busy road with quite significant traffic.
- The protective side walls along the length of the bridge carriageway have fallen off the bridge so that there is no side safety barrier.
- The bridge carriageway is slightly narrower than the roadway making it difficult for modern traffic.
- Some of the large agricultural vehicles that need to regularly cross the bridge are of such a size that they take up the full width of the bridge and they may be in danger of falling off.
- On the north-western side of the bridge is the Witmos Primere Skool. A farm school that currently accommodates 61 primary school age children. These are the children of local farm workers whose parents have limited resources. Twenty of the children stay in a boarding facility at the school. The remaining 41 have to get to school each day. Many of these have to cross the bridge on foot in order to get to the school. In itself this is dangerous and even more so when there is vehicular traffic. (Interview with Ms R Nel, Acting Head, Witmos Primere Skool, 19.11.2019)
- Other pedestrians also use the bridge.
- Without side safety walls and due to its narrowness the bridge is unsafe for pedestrians and vehicles.

Figure 3: School pupils crossing the bridge. (Source: Afrisa Consulting.)

Figure 4: Tractor crossing the bridge. (Photo: The Author)

Figure 5: The bridge carriageway. Note the missing safety walls. (Photo: The Author)

Figure 6: Missing side safety wall. (Photo: The Author)

Figure 7: The bridge carriageway showing missing side safety walls. (Photo: The Author)

Figure 8: The bridge from the west. (Photo: The Author)

Figure 9: Detail of the arch. (Photo: The Author)

Figure 10: Stonework at the base. (Photo: The Author)

Figure 11: Arch and keystone. (Photo: The Author)

Figure 12: Stonework detail. (Photo: The Author)

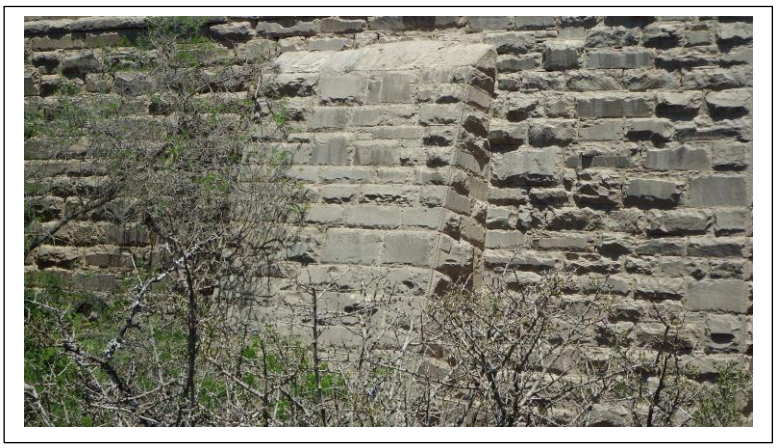

Figure 13: Stonework side buttress. (Photo: The Author)

Figure 14: Bridge from the east. (Photo: The Author)

The bridge is an historic piece of transportation infrastructure that in today's world has functional deficiencies particularly in terms of safety.

1.2. BROAD PROJECT PROPOSAL:

The project is located on the DR02481 in the Blue Crane Route Local Municipal Area in the Sarah Baartman District.

Figure 15: Project Location (Source: Afrisa Consulting)

The following is a broad description of the project process and proposed outcome as described in the Engineering Advice and Services Background Information Document:
“A Basic Assessment process has commenced to assist the Eastern Cape Department of Transport (ECDOT) in determining the environmental and social impacts of the intended DR02481 bridge refurbishment and bypass road construction and to obtain an Environmental Authorisation from the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT). Parallel applications will be made for a Water Use License (in order to construct the bypass road within a watercourse), as well as the relevant heritage permits (for refurbishments of the historical bridge structure).

The bridge and site for the bypass road is located near Klipfontein, 25.3 km along the DR02481 road, north of Cookhouse. The historical single-arch stone bridge has deteriorated to such an extent that it needs to be temporarily closed for refurbishment. The current condition of the bridge poses a safety risk to pedestrian and vehicular traffic. In order to undertake this, a deviation, including a low-level watercourse crossing in the form of a vented causeway will have to be constructed. The total area of the bypass is approximately 7 436.4 m2 and will cover an approximate distance of 540 meters.

The bridge and proposed stream crossing occur within a perennial river/watercourse/drainage line namely the Kariega River stream. The Kariega River is a

tributary of the Great Fish River and the confluence is located approximately 150 meters east of the bridge.

The works will require an Environmental Authorisation and Water Use License. In addition, the existing bridge is older than 60 years and will thus require a permit from SAHRA to implement the necessary refurbishing measures. It is anticipated that the deviation will be operational for an extended period in order to complete the necessary bridge refurbishing works and to accommodate traffic should the stone bridge sustain damage due to flooding.

Assessments to be undertaken will include:

- A full heritage assessment of the current bridge to apply for a permit application with SAHRA.
- An aquatic specialist will assess the impacts on all water related components likely to be affected by the works as well as applying for a water use license.
- An Ecological Assessment will be undertaken by a specialist to establish how the construction of the bypass and the refurbishing of the bridge will impact on the ecology of the site and its surrounding area.

There are no protected areas or nature reserves located closer than 5 kilometres from the proposed site and no World Heritage Sites or National Parks are located within 10 kilometres of the site. The vegetation at the site has been degraded by farming activities and is predominantly surrounded by cultivated land, while the banks are covered by either dense bush or typical riparian flora elements such as reeds and grasses.

The proposed construction and refurbishing will entail, inter alia, the following activities:

- Clearing of vegetation from the marked off area for the construction of the bypass
- Removal of debris, silt and blockages in the Kariega River stream
- Installation of pipe culverts in the Kariega River stream
- Concrete approaches on either side of the low water stream crossing structure
- Installation of wire basket gabions and mattresses for bank stabilisation and prevention of scour and erosion of streambed
- Installation of road signage
- Work on the carriageway of the bridge to widen it and to improve safety for vehicles and pedestrians.”

Figure 16: Overall project proposal. (Source: Afrisa Consulting)

See also Annexures 1 and 2 being a Location Plan and a Project Diagram prepared by Engineering Advice and Services.

1.3 PROPOSED BRIDGE ALTERATIONS:

The proposed alterations to the bridge consist of the construction of a new widened platform carriage way on top of the existing carriageway with a pedestrian walkway. The proposal is shown in the plans in the Annexure which is attached to this report.

2. COMMUNITY CONSULTATION:

2.1. INFORMAL CONTACTS:

During a site inspection on 19th November 2019 informal discussions took place with the following:

Figure 17: Ms R Nel, staff and scholars Witmos Primere Skool. (Photo: The Author)

Ms R Nel Acting Principal Witmos Primere Skool
Ms M Lord Teacher Witmos Primere Skool
Ms D Wright Teacher Witmos Primere Skool
The above all confirmed that in their opinion the bridge was inadequate for current usage by vehicles and pedestrians including school children. Safety on the bridge was a big concern.

Figure 18: Mr I Britz. (Photo: The Author)

Mr I Britz a Labourer: Mr Britz, who works there, but lives in Cookhouse, felt that the bridge needed some improvements to make it safer for all.

Telephonic interviews were conducted on the 28th November 2019 with Mr G Erasmus an elderly local farmer with a knowledge of local history, and Mr M Vermaak a prominent local farmer who is the owner of a number of farms on both sides of the bridge. Their comments were:

- Mr Erasmus confirmed that the railway line was relocated in about 1960 and he was not aware of any other heritage issues in the location of the bridge other than those described in this report.
- Mr Vermaak confirmed that his large agricultural vehicles could not cross the old bridge if the old side walls were replaced. He also expressed concern about the safety of pedestrians crossing the bridge, especially children and the elderly.

2.2 FORMAL MEETING:

A formal meeting and presentation of the EIA and its heritage studies to affected and interested parties, including heritage bodies, to is to be held at a date to be decided once the lockdown allows it.

3. HERITAGE RESOURCS IN THE AREA OF THE BRIDGE:

3.1. LANDSCAPE ISSUES:

The landscape of the Fish River Valley is a cultural heritage landscape of note. It is rich with intangible heritage connotations dating back to the earliest human occupation, through the long period of warfare that characterised the late eighteenth and most of the nineteenth centuries, the development of Cookhouse and Cradock, the early development of agriculture and the transformation of the valley through irrigation into a ribbon of intensive agriculture. See also section 1.1.1. of this report.

The bridge exists within this cultural heritage landscape context.

3.2. NEARBY HERITAGE STRUCTURES:

There are a number of heritage structures within the vicinity of the bridge. They include the following:

- The Witmos Primere Skool. There are two school buildings plus an ablution block on the site which is immediately to the north east of the bridge. The main building is the old Head Master's house that now includes classrooms, a boarding facility for 20 children, a kitchen and bathroom. The building has been much altered over the years. It looks as if it dates from about the1930's. The other significant building is a classroom. Culturally and socially the school is an important institution, but from an architectural heritage perspective it is of limited interest.

Figures 19 & 20: Witmos Primere Skool (Photos: The Author)

- Adjacent to the school complex is an old house or shed that has been converted into a conference centre. This building is of little heritage value.
- Nearby to the north are a complex of industrial sheds which form part of the surrounding farming economy. They appear to be currently unoccupied and are of little heritage value.
- Adjacent to the industrial sheds is an old farm house which is occupied. It looks as though it dates from around the 1930's as well. It has been altered, is not in good condition, but has some limited heritage value.

Figure 21: The conference centre. (Photo: The Author)

Figures 22 & 23: The industrial sheds and the old farm house. (Photos: The Author)

- About 12 kilometres south along the DR02481 is another similar stone bridge which must have also been a part of the old railway alignment. It is also a little narrower than the road and somewhat damaged above carriageway level. It appears to be structurally sound below and has been repaired with concrete at some stage. This bridge, which differs in that the side ramps are stone clad, but the central arch is concrete, has heritage value.
- About a kilometre north along the DR02481 is the old Klipfontein station building and platform no longer used as a railway station. Currently the building complex is used as a family house and is in poor condition. This complex, despite its poor condition and change of use, is an important part of the heritage of this area.

Figures 24 & 25: The other old bridge and the old Klipfontein station. (Photos: The Author)

With the exception of the other old bridge which is 12 kilometres south, these other structures all lie north of the Kariega stream and are shown below:

Figure 26: Location of structures in the vicinity of the bridge. (Source: Google Earth)

The bridge is both part of the greater valley and part of this smaller complex.

3.3. BRIDGE DR02481

Figure 27: Bridge DR02481 (Photo: The Author)

As a heritage structure, the bridge has value in terms of:

- Its visual elegance and beauty.
- It is a good example of a traditional system of construction of an arched bridge.
- It is a significant example of traditional dressed stonework and stone arch construction.
- It is part of the transportation history of South Africa and the Fish River Valley.
- It is part of the history of rail development in South Africa.
- It contributes to the heritage value of this part of the valley.

On the negative side the bridge has the following deficiencies:

- The bridge at the carriageway level has sustained some damage (no side safety walls).
- The original rail lines have been removed and the carriageway covered in compressed layers of gravel as a contemporary continuation of the DR02481.

In the light of the above, as a heritage structure it is judged to be of Local or General importance and to comply with the requirements of category 3B.

3.4. SUMMARY OF HERITAGE ISSUES:

Heritage issues may be summarised as follows:

- The Great Fish River valley is a cultural heritage landscape.
- The area around the bridge contains a number of heritage structures which are interesting, but none are of outstanding interest.
- The bridge is of General importance and is a 3B grade structure.

4. IMPACTS OF THE PROPOSED PROJECT:

4.1. IMPACT OF THE BYPASS PROPOSAL:

The impact of the bypass proposal in environmental, ecological, palaeontological and archaeological terms are the subjects of separate reports.

4.2. THE BRIDGE:

A new reinforced concrete carriageway platform will be constructed on top of the bridge and will overhang on both sides. There will be a pedestrian walkway with a safety balustrade and side kerbing as part of the new concrete platform. The safety and utility of the bridge will be considerably improved. The appearance of the bridge will be altered.

4.3. SUMMARY OF IMPACTS:

The impacts of the project may be summarised as follows:

- The bypass will create an alternative route and its impact on the stream, etc will be dealt with in separate reports.
- The bridge will be a much safer and more functional entity.
- The bridge will be impacted visually by the new platform with its carriageway and pedestrian walkway and safety balustrades.

5. ALTERNATIVE APPROACHES:

There are a number of alternative scenarios for the bridge. These are:

5.1. Do nothing – leave the bridge exactly as it is with damaged/removed side safety walls. This is not acceptable from a usage and safety point of view, and from a heritage point of view it will lead to further deterioration of the bridge.

5.2. Reconstruct the safety side walls in new stone as replicas of the old safety side walls and do whatever restoration and repairs may be needed. From a strict architectural historical point of view this is not acceptable because changes the reduces the heritage value of the bridge by introducing an element of replica that dishonestly masquerades as original. It is also not acceptable from a functional point of view because the bridge as it was, was too narrow for some modern traffic and there was no provision for safe pedestrian use of the bridge.

5.3. Clear the gravel from the bridge carriageway and effect what repairs may be necessary to the bridge and its stonework and foundations with the aim of making sure that the old structure is sound. Then construct a new wider carriageway in reinforced concrete with safety balustrades on both sides and that has space for a pedestrian walkway. This approach is the most acceptable as it resolves current functional and safety issues and preserves what is left of the old bridge while honestly revealing the new work to be contemporary. Architecturally historically this is the most acceptable approach. However, this approach is the acceptable one provided that:

5.3.1. Any repairs to the bridge are carefully executed in a manner that maintains the architectural integrity of the bridge as a traditional stone structure while preserving the structural integrity of the bridge.

5.3.2. The clearing and cleaning of the gravel off the old carriageway and any repairs to this are executed in a careful manner that protects the integrity of the old structure while ensuring the structural soundness of its fabric.

5.3.3. The design and construction of the new reinforced concrete carriageway and the pedestrian walkway and balustrades are carefully executed without any lasting damage to the existing structure. For instance, in the casting of the concrete no slurry may drip from the formwork and permanently stain the existing stonework of the old bridge. In general, special care must be taken in both the design and construction not to damage the existing stonework of the bridge.

6. RECOMMENDED MITIGATION:

It is recommended that alternative 5.3 is the acceptable alternative. This alternative resolves the current functional and safety issues and is architecturally historically the most honest approach. It will result in a heritage structure that can be clearly read in terms of authenticity of original and new work. The nature of this alternative is such that the following are recommended:

6.1.1. The engineering consultants must undertake a thorough structural examination of the old bridge and effect any repairs necessary to ensure the structural integrity of the old bridge.

6.1.2. Once the detail design of any repairs to the old bridge are complete, they must be subject to approval of a suitable heritage specialist.

6.1.3. Once the detail design of the new reinforced concrete carriageway and pedestrian walkways is complete, they must be subject to the approval of a suitable heritage specialist.

6.1.4. Once construction is underway the works must be inspected at least twice by a suitable heritage specialist to ensure that the new work is being executed in such a manner that it does not damage the old.

ANNEXURE: DRAWINGS OF PROPOSED ALTERATIONS TO THE BRIDGE

See the following attached drawings:

1A Location and Site Plan May 2020

1710-T-STR-0001 Bridge Layout April 2020

1710-T-STR-0002 Sections and Details April 2020

1710-T-STR-020 Bridge Reinforcement April 2020

REFERENCES:

In Situ Interviews on 19th November 2019 with:

Ms R Nel Acting Principal Witmos Primere Skool

Ms M Lord Teacher Witmos Primere Skool

Ms D Wright Teacher Witmos Primere Skool

Mr I Britz a Labourer

Telephonic interviews on 28th November with:

Mr G Erasmus, Farmer.

Mr M Vermaak, Farmer.

Internet sources:

"Eastern Cape Wars of Dispossession 1779 – 1878", South African History on Line, sahistory.org.za, 19.11.2019.

Wikipedia: Orange-Fish River Tunnel, 19.11.2019.

Wikipedia: South African Locomotive History, 15.11.2019

Documents:

Engineering Advice and Services Background Information Document (Unpublished).

Afrisa Consulting "Quotation for Engineering and Environmental Services Associated with Contract SCMU5-16/17-0021C" (Unpublished).