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## Developing Kruger Shalati: The Train on the Bridge

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**Keywords:** *new hotel development; project management; case study; modular construction; ecotourism; experiential hospitality; kruger national park; wagon-lit, railway bridge; railfans; ESG, authenticity.*

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# Developing Kruger Shalati: The Train on the Bridge

## A Unique Modular Hotel Construction Case Study in Kruger National Park

Gert Noordzy <sup>α</sup>, Richard Whitfield <sup>σ</sup>, Li-Chun Lin <sup>ρ</sup> & Tshepo Makhudu <sup>ω</sup>

**Abstract-** This is a case study on the development of the *Kruger Shalati: The Train on the Bridge*, a themed, luxury boutique hotel in Kruger National Park (KNP), South Africa. Two key drivers of this project were authenticity and a strong ethos for Environmental, Social and Governance (ESG). Considering the target market the hotel serves and the local situation, this case study explains why modular construction was better to build parts of the property, instead of using traditional in situ construction methods. It further explains how the hotel was built, and the challenges that had to be addressed to complete the project. Finally, it examines how the use of modular construction methods and the uniqueness of the project impacted the normal hotel pre-opening activities and ongoing hotel operations. This case study has been prepared after reviewing published materials about the project and extensively interviewing five senior members of the project team.

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Source: Keith Stannard

*Exhibit 1:* Kruger Shalati: the Train on the Bridge

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## I. EXECUTIVE SUMMARY

This case study <sup>1</sup> is on the development of the *Kruger Shalati: The Train on the Bridge*, <sup>2</sup> a themed, luxury boutique hotel in South Africa. It is uniquely formed from authentic train carriages, permanently stationed <sup>3</sup> on the historically-rich Shalati Bridge above the Sabie River within the Kruger National Park. The carriages were recovered from a train graveyard and then refurbished, using prefabricated prefinished volumetric construction (PPVC) methods with a twist. This case study illustrates the processes of developing a unique new hotel concept and operationalizing the vision. It also illustrates the motivations for using this alternative construction method for hotels in remote locations with high levels of difficulty and complexity, as well as the practical benefits and challenges of adopting it.



Source: Kevan Zunckel, Zunckel Ecological + Environmental Services

*Exhibits 2 and 3:* Views from the bridge: eastward (*left*) in winter and westward (*right*) in summer, river swollen from rainfall

In modular construction, a building is made in sections in a factory while the foundations are prepared at the site where the building is to be located. <sup>4</sup> The building sections are then transported to the site and assembled onto the foundations using cranes. The building sections may be a flat wall, floor, and/or ceiling panels that are assembled like a house of cards. Alternatively, they may be volumetric boxes that are arranged and stacked like shipping containers. A building may be composed of a mixture of panels and volumes as needed.

By contrast, hotels are mostly built using traditional construction methods whereby manpower, machinery, and materials are assembled at the building site and the workforce uses the machinery and materials to construct the facilities in situ. On completion of the construction project, the waste materials and machinery are removed from the site and the workforce is disbanded.

To begin, and to provide a context, the authors describe KNP and its local market situation, then consider why modular construction was adopted for the project. The authors then assess how the Kruger Shalati project was conceptualized and delivered, following the project life cycle for new hotels <sup>5</sup> (Noordzy & Whitfield, 2021a):

1. *Hotel Conceptualization Stage:* First, the authors assess the concept development and tender process, to evaluate the environmental, financial, and economic viability of the proposed project.
2. *Hotel Delivery Stage:* Second, the authors explain how Kruger Shalati was designed, prototyped, built, and opened. In particular, the authors review the refurbishment, transportation, and positioning of the train carriages.
3. *Hotel Operations Stage:* Third, the authors review the main differences in operations and maintenance when compared to more conventional hotel development projects.

Finally, the authors discuss the achievements and lessons learned of this novel hotel development project.

<sup>1</sup> Yin, R. K. (2002). *Case Study Research, Design and Methods* (3rd ed.). Newbury Park, Sage Publications.

<sup>2</sup> Kruger Shalati (PTY) Ltd. (2021, September 7). *Kruger Shalati the Train on the Bridge*. [www.krugershalati.com/](http://www.krugershalati.com/)

<sup>3</sup> Balt, M. (2019, July 1). *Project manager answers KNP train questions*. Lowvelder. <https://lowvelder.co.za/490727/project-manager-answers-knp-train-questions/>

<sup>4</sup> Noordzy, G., & Whitfield, R. (2021b). Modular Construction, An Important Alternative Approach for New Hotel Development Projects. *The Journal of Modern Project Management*, 9(2), 217–235. <https://doi.org/10.19255/JMPM02715>

<sup>5</sup> Noordzy, G., & Whitfield, R. (2021a). The New Hotel Development Project Life Cycle. *The Journal of Modern Project Management*, 8(3), 89–99. <https://doi.org/10.19255/JMPM02508>

## II. CONTEXT AND MOTIVATION FOR MODULAR CONSTRUCTION

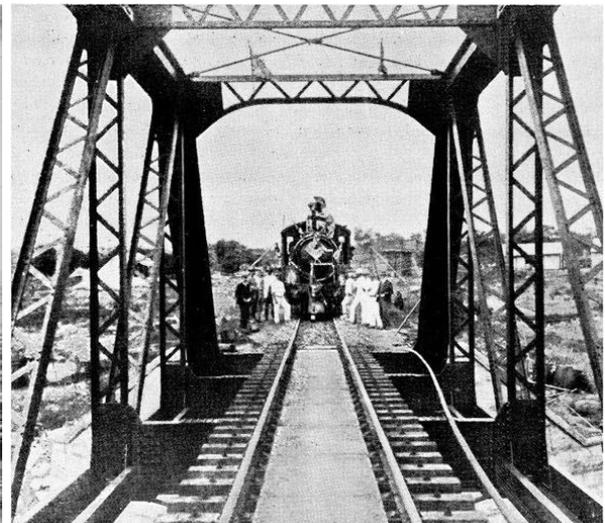
### a) Kruger National Park, South Africa

The Kruger National Park <sup>6</sup> is a world-famous 19,485km<sup>2</sup> protected area in the north-eastern part of South Africa, near the border with Mozambique. It was established in 1898 and is one of the largest parks in Africa, most famous for the Big Five: lion, leopard, rhinoceros, elephant, and Cape buffalo. It hosts hundreds of other mammal species and a diverse range of fauna and flora. It is part of the "Kruger to Canyons Biosphere", officially designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO), <sup>7</sup> as well as part of the Great Limpopo Transfrontier Conservation Area with Mozambique and Zimbabwe. <sup>8</sup> Geographically it is sub-tropical and includes mountains as well as bush plains and tropical forests.

Each year, the park welcomes approximately 1 million visitors, mostly South African nationals. The park is managed by South African National Parks <sup>9</sup> on behalf of its traditional landowners and the people of South Africa. It has good infrastructure, including roads, and contains a variety of lodges and camps, where most international and national visitors, who make up a large portion of the total number who visit the park annually, stay. SANParks manages a number of these camps, which include chalets, shops, restaurants, etc. In addition, SANParks have provided concessions for third-party private developers and operators to develop and operate safari lodges and camps for definite periods within concession areas, within which the concessionaire has sole access. These concessions, along with others, and entrance fees are the major sources of park income. These are used to pay for its operations and maintenance, and to support the traditional owners.

Because of the dangers to human life, access to the park is quite restricted, and visitors can only stay overnight housed in approved accommodation. To preserve its ecology, there are also restrictions on materials, flora and fauna that can be brought into the park. For example, the use of industrial pesticides are strictly controlled. The KNP has a serious problem with alien invasive plants and therefore needs to use herbicides, but the concessionaires are not responsible for natural resource management and therefore this remains a KNP responsibility, unless otherwise stated in their PPP agreement. In addition, relatively severe penalties apply for poaching, damaging, or defacing the landscape and historic structures within the park.

From the early 1900s, visitors were able to undertake multi-day train tours of the park, sleeping overnight in the carriages and traveling between points of cultural and natural interest during the days (Kruger Park, 2021). <sup>10</sup>In 1923, South African Railways (SAR) curated a tour to the Lowveld and the border of Maputo. The trains would travel from Komatipoort to Sabie Bridge during the day, a game ranger would accompany the tourists and would stay with them at Sabie Bridge. At the time, there were no overnight facilities, therefore the tourists slept on the train. <sup>11</sup>



Source: SANParks, Republic of South Africa

*Exhibits 4 and 5: A train in Kruger National Park in the 1920s*

<sup>6</sup> Kruger National Park. [www.sanparks.org/parks/kruger](http://www.sanparks.org/parks/kruger)

<sup>7</sup> UNESCO. (2001). *Kruger to Canyon Biosphere Reserve, South Africa*. <https://en.unesco.org/biosphere/africa/kruger-to-canyon>

<sup>8</sup> Great Limpopo Transfrontier Park. (2021). *A Major Dynamic Conservation Initiative*. [www.greatlimpopo.org](http://www.greatlimpopo.org)

<sup>9</sup> South African National Parks. (2021.) *Kruger National Park*. [www.sanparks.org/](http://www.sanparks.org/)

<sup>10</sup> Kruger Park. (2021). *Modern History of Kruger National Park*. [www.krugerpark.co.za/Krugerpark\\_History-travel/kruger-national-park-modern-history.html](http://www.krugerpark.co.za/Krugerpark_History-travel/kruger-national-park-modern-history.html)

<sup>11</sup> Big on Wild. (2018, July 27). *History of the Kruger National Park - Part One*. <http://bigonwild.co.za/history-of-kruger-national-park-part-one/>

By the 1970s, increasing freight train traffic on the railway line through the park was killing many animals after they wandered onto the tracks and so the train line was relocated outside the park boundary. At that time much of the track in the park was removed, but the stations, bridges, and other structures were left as historical relics.



Source: Kelly Ermis

*Exhibit 6:* The Shalati Bridge over the Sabie River

In the 2010s, park management looked to increase its income by refurbishing abandoned structures for accommodation and other purposes.<sup>12</sup> Among other proposals, it issued a tender for a 25-year concession based on repurposing and refurbishing the Shalati Bridge and nearby Kruger Station. In particular, park management hoped that an accommodation experience could be created that paid homage to the earlier train tours of the park. The site consisted of the station building and bridge connected by approximately 500m of track in a sweeping curve. The bridge is a historic monument and could not be altered or damaged. Kruger Station was built after the railway closed to house a locomotive with carriage and information displays about the old railway and had to be kept. At the midpoint of the track, there was also “Waterkant”, a historic, SANParks managed, thatched structure, that was not originally included in the site and was not historically protected.



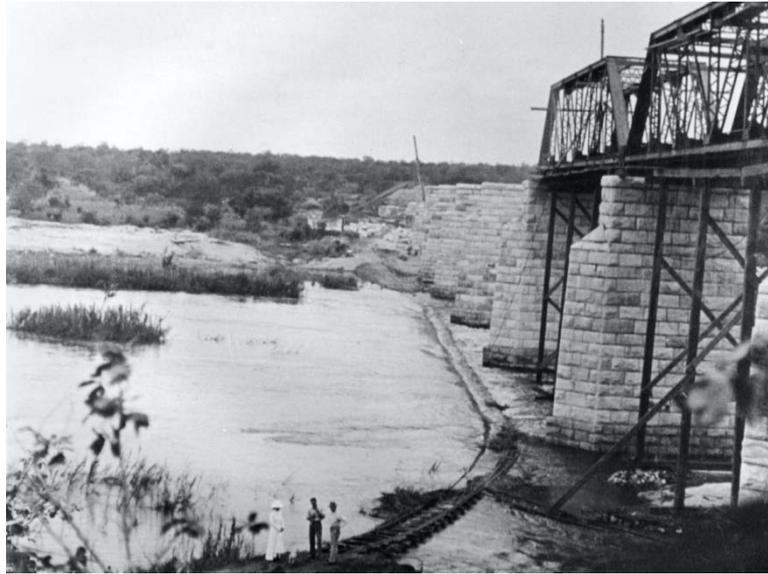
Source: SANParks, Republic of South Africa

*Exhibit 7:* Waterkant

<sup>12</sup> Balt, M. (2029, July 13). *This train will go nowhere but reminds of the past*. Lowvelder. <https://lowvelder.co.za/554756/this-train-will-go-nowhere-but-reminds-of-the-past/>

Opposite the station, there was a redundant Distribution Center (from when KNP did its own procurement). These structures are located within Skukuza Camp, which is the administrative headquarters of KNP, and home to approximately 1,000 residents. The Shalati Bridge itself is located just outside of the camp.

The 400-meter-long single line bridge dates from 1910, and consists of repeating steel-arched sections that span between 9 sandstone piers. It is a very early example of modular construction, wherein the steel sections were made in the United Kingdom and transported by sea and overland to the site before being craned into position on the locally built piers. The bridge has sweeping views and stands approximately 15 meters above the Sabie River, which is known for its crocodiles, hippos, buffaloes, and elephants. In addition, the area boasts abundant bird life.



Source: SANParks, Republic of South Africa

*Exhibit 8:* The Shalati Railway Bridge under construction

Interestingly, the park management came up with the original idea for a train-based hotel that would move out onto the bridge every night and then be drawn back to the station during the day. During the bidding process it was agreed that the train would be static and remain on the bridge permanently. The reason being the impracticality of installing the infrastructure that would be required to facilitate this daily movement.

The Thebe Tourism Group (Thebe), now known as the Motsamayi Tourism Group, with Londolozi Private Game Reserve as its operating partner, won the tender with a proposal for a luxury boutique hotel, using the station as an information center, a new building to house the hotel reception and dining area, and refurbished train carriages, repurposed as guest rooms, permanently parked on the bridge, with a newly added pedestrian pathway for guest room access.<sup>13</sup> The company was founded by Nelson Mandela with a vision to create iconic tourism products and has a strong culture of community involvement and community upliftment.

The current visitor market of KNP is largely Caucasian (mainly Afrikaans-speaking) and aging, requiring park management to consider new products to attract a new generation of visitors with different demographics. The proposed target market for Kruger Shalati was middle class and up South African and international train enthusiasts, looking for a truly unique park experience. In addition, Thebe's proposal maximized park income and benefited the traditional landowners by making them shareholders and providing employment and business opportunities. Thebe did not have direct hotel experience but formed alliances with well-respected hotel and tour operators, and engineering firms for the project. By contrast, it did have a strong track record in successfully fostering partnerships to develop new ventures in a variety of industries.

#### *b) The Shalati Bridge and Kruger Station*

*Kruger Shalati: The Train on the Bridge*, fully opened in February 2021, comprising 13 carriages on the bridge, with 4 carriages to the south and 8 carriages to the north of the lounge car. Each carriage is divided into 2 luxury rooms. The lounge car is positioned opposite a non-historic water tower, which has been repurposed as the hotel's suspended swimming pool, and is connected to the lounge car with a deck. The KNP has several information centers and Kruger Station serves to provide history on the railway line, the trains, and the bridge. Kruger Station has

<sup>13</sup> Wiley, M. (2020, December 16). *Look inside a luxury hotel made of vintage train cars that sits atop a bridge in South Africa's largest national park.* Insider. [www.insider.com/kruger-shalati-hotel-on-bridge-south-africa-kruger-national-park-2020](http://www.insider.com/kruger-shalati-hotel-on-bridge-south-africa-kruger-national-park-2020)

been repurposed as the park information center, including a 360° video information wall, public dining facility, and souvenir outlets. “Waterkant”, the non-historic lodge accommodation, has been rebuilt as the Bridge House, using a “shed style” to align with the “railway/steel” architectural style. It houses the hotel's reception, indoor/outdoor dining facility with kitchen and double swimming pool. It also incorporates several hotel rooms in separate buildings, that opened in 2022. Finally, a spur and switch were added to the railway to connect it to the Distribution Center, which SANParks allowed the hotel to take over and repurpose as an operation center (for its back-of-house areas), with photovoltaic panels added to its roof. As discussed later, the result differs somewhat from the initial tender proposal. Please refer to *Appendix A* for a map of Skukuza Rest Camp, Kruger Station, and the Shalati Bridge.

Initially planned as a 3-year development, completion of the entire project took over 6 years. Obtaining the Environmental Approval, without which the project could not commence, took much longer than predicted due to the general sensitivities of the site. Construction from the first car arriving at the factory in Johannesburg to full and final occupation by paying guests in Skukuza took 3 years.

The reasons are explained and discussed below. While the Covid-19 pandemic has delayed project work (*this turned out to be a blessing, allowing for design enhancements*), and is expected to reduce hotel occupancy in the short term, Kruger Shalati has a promising future, if industry and social media “buzz” is a good indicator.

### III. HOTEL CONCEPTUALIZATION STAGE

KNP is an important global asset with tremendous biodiversity and cultural heritage. It is an important source of economic activity and national pride for the Republic of South Africa. SANParks' tender process required the candidate concessionaire to elaborate in detail the dynamics of the product and service offering, socio-economic impact (i.e., how the project will support local economies), operating policies and procedures, transformation and business plans, and environmental impact. To manage this process, Thebe appointed a project manager, and formed partnerships with a hotel operator, tour operator, railway and civil engineering consultants, and an interior design firm. In addition, it engaged specialty consultants to prepare the project cost analysis and return-on-investment model, and conduct the environmental impact assessment. Because the proposed hotel project was in a national park, the Department of Environmental Affairs (DEA), (now called the Department of Forestry, Fisheries and the Environment (DFFE)) required detailed plans in advance before Environmental Clearance could be issued and any work could start. These requirements formed part of the Environmental Impact Assessment (EIA) and the subsequent application for Environmental Authorization, which was accompanied by the Final Basic Assessment Report and Environmental Management Plan Report.<sup>14</sup> This provided the project team with the advantage of a compulsory pre-planning process.

To plan scope, time and cost, instead of refurbishing old carriages, the project team did consider the options of a.) buying new train carriages and b.) building modular “replicas” of railway carriages. Both options were deemed not viable:

- *Option a:* It was felt that partnering with a train carriage manufacturer outside of South Africa had no special advantages. It would make design coordination and quality monitoring more complex and would introduce the added difficulties of transporting the railway carriages much longer distances by ship as well as road.
- *Option b:* Given the extensive structural modifications envisaged for the carriages and the known and unknown additional difficulty of renovation works when compared to new build construction, some consideration was given to the idea of building new “replicas” of railway carriages. However, all the stakeholders agreed that authenticity was crucial to create the unique guest experience and establish the “high-end” market positioning of the proposed hotel.

#### a) Tender Process

Preparing the tender document took considerable efforts to develop and design the entire hotel concept, and to evaluate its environmental, financial, and economic viability. It also required extensive discussions with park management and public consultation with the traditional landowners; most stakeholders are conservative in their outlook.

Stringent site restrictions to minimize the dangers to human life, ecological degradation, and damage to the historic monuments, along with the novel nature of the hotel rooms, required an alternative approach to in-situ construction. The project team estimated that the best approach was to renovate and refurbish authentic railway carriages as guest rooms off-site in Johannesburg and then move them into position on the bridge. This decision required the project team to manage the following constraints:

<sup>14</sup> Zunckel, K. (2018). *Kruger Shalati, Environmental Assessment Report and Environmental Management Programme Report*. Zunckel Ecological + Environmental. <https://zunckelecological.wordpress.com/resources/>

1. *Production:* Identify steel and carpentry works near Johannesburg, chosen for its industrial base (incl. mining), large population ( $\pm 5m$ ), intervening road infrastructure and relative proximity to KNP ( $\pm 400km$ ).
2. *Transportation:* Acquire a specialized large container transport vehicle with adequate lifting cranes to transport a single railway carriage, measuring  $\pm 25$  meters in length, over 4 meters in width and weighing 30 tons.
3. *Roads:* Investigate possible routes and limitations (e.g., size, access times, escort, etc.) outside and inside KNP.
4. *Tracks:* Add a straight spur and switch to the existing track between the bridge and station, as a railway carriage can only be mounted onto a straight length of the track. (*The space on the spur also allowed carriages to stack-up on arrival, for remedial works and fit-out, before moving them onto the bridge.*)



Source: Andrea Kleinloog

*Exhibits 9 and 10:* Adding the straight spur and switch

#### b) Environmental Impact Assessment (EIA)

Thebe appointed an independent environmental impact assessment practitioner and an independent heritage resources consultant to conduct the EIA and to ensure that every relevant aspect was reviewed:

1. *Impact Assessment:* To assess the impact of the proposed hotel on the biodiversity and ecosystem within the park, traffic flows, light pollution, waste disposal, and the capacities of local utilities and sewerage, and other infrastructure, and to determine if potential impacts could be avoided, mitigated or off-set.
2. *Historic Structure (Impact) Assessment (HSA):* To ensure the preservation of historic structures, emphasis was put on the heritage value. The final product had to mirror what the carriages looked like in the 1930s and 1950s.
3. *Structural Assessment:* To demonstrate that the bridge could easily handle the static loads of a train permanently parked on it.
4. *Hydrological Assessment:* To confirm that the bridge deck and buildings are well above the 100-year flood level, and that there were no significant hydrological features that would be impacted on by the development and its operations. Included in this assessment was an assessment of flood risk, which is implied in the application of the 1:100-year flood line.
5. *Visual Impact Assessment (VIA):* Part of the EIA, the visual and heritage aspects played a key role in the finish of the carriages, so that they resembled the look of those used at the time the railway line was in use. This required interesting research to ensure this requirement was met.
6. *Traffic Impact Assessment (TIA):* Part of the EIA to assess potential impacts of traffic generated by the proposed project on the KNP infrastructure and environment.

The DFFE granted Environmental Authorization, but imposed specific conditions to be complied with, to make sure that identified negative impacts were fully avoided or mitigated, including:

- *Traffic Burden:* The TIA found that a large part of the hotels guests would arrive by airplane to the nearby Skukuza Airport (SZK), i.e., the hotel would not add substantially to the traffic volumes in the south the KNP.
- *Light Pollution:* To reduce nighttime light pollution only minimal external lighting may be used; these are not allowed to be visible from the Skukuza Camp.
- *Fire Safety:* Park authorities judged it was too dangerous to permit gas storage or cooking facilities within the carriages, especially on a permanently parked train.
- *Compliance:* Once Environmental Authorization had been received, the developer must appoint an independent environmental compliance officer (ECO) to monitor implementation throughout out the development cycle of the project.

Key advantages were that the railway line and bridge infrastructure, and infrastructure for running the development and managing the daily operations were already in place. The EIA demonstrated that the project would require next to no clearing of undisturbed vegetation and would not impact the natural flora and fauna.

Initially, it was estimated that the assessment process would take 9 months, but eventually it took 18 months before any construction on site could start. One of the main reasons for the extended time was because the authorities wanted to make sure that any risk of appeal against a positive record of decision were minimized as far as possible. Given that the KNP has an active and well-informed watchdog group, it was possible that an appeal could have been lodged. Nonetheless, in many ways, the impact assessment was simpler than it would be for a comparable greenfield hotel site within the park, because it largely repurposed and reused pre-existing buildings and other structures. In addition, the area is zoned as “high-intensity leisure” by SANParks and does not fall in a wilderness zone.

#### c) *Concession*

By the time the Environmental Clearance was received and the 25-year Concession Contract was signed, the project team had spent 18 months planning and brainstorming. It was only possible to successfully navigate this process because Thebe had the foresight to bring together innovative and adaptable partners with the full spectrum of required expertise from the onset.

In the words of its C.E.O., Thebe won the bid by “sheer madness”, with a project team, including railway fanatics with a deep understanding of railways and engineering, that was able to start from scratch, a design team with carte blanche that “really went to town” and a management team that “was hungry for it”.

The winning concept of the final tender entailed:

1. Sourcing old railway carriages in South Africa and refurbishing these in two close-by Johannesburg factories; then transporting them by road to mount them on railway tracks and move them into permanent positions on the bridge.
2. Manufacturing an external walkway on the bridge, an on-bridge deck and suspended swimming pool, as well as a service channel and pier-top sewerage holding tanks in a third factory; then move and install these onto the bridge.
3. Adding a short rail spur line and switch to the Distribution Center.
4. Taking over the Distribution Center from SANParks and repurposing it as an operations center with back-of-house areas, including adding photovoltaic panels to the roof.
5. Demolish “Waterkant” and build new accommodation elsewhere for SANParks to offset the loss of room inventory.
6. Creating a new Bridge House between the station and bridge as the hotel's front-of-house area, with reception, indoor/outdoor dining area, kitchen, double swimming pool, as well as several additional luxury guest rooms.
7. Renovating and expanding the 1,000m<sup>2</sup> Kruger Station building to extend the park information center, food & beverage, edutainment, and souvenir outlets that are all open to the public.

## IV. HOTEL DELIVERY STAGE

#### a) *Architecture*

Once the *architectural* work commenced, the project team recognized that mixing publicly accessible areas (e.g., the park information center, restaurants, and souvenir outlets) with luxury boutique hotel front-of-house areas (e.g., concierge, reception and dining) in the same building was neither desirable, nor workable. An agreement was reached to demolish “Waterkant”, the non-historic basic lodge accommodation and rebuild it as the hotel reception and related areas, using a similar building footprint. This allowed for additional space to add six non-carriage hotel rooms and a honeymoon suite within this new Bridge House area, making the hotel concept accessible for

prospective guests with acrophobia as well. Please refer to *Appendix D* for the TOB interior design drawing of a typical non-carriage hotel room.

To take better advantage of the dramatic views from the bridge and to increase the hotel's "Wow! factor", the project team decided to re-purpose the old steam train re-watering tower as a suspended swimming pool with a deck instead of demolishing it. The tower was 1/3 the way down the bridge and was not a historic landmark. Therefore, it could be altered and a deck could be added to link it to the bridge, on the condition that the deck could be removed at the end of the concession to restore the bridge to its original state.



Source: Andrea Kleinloog

*Exhibits 11 and 12:* Suspended swimming pool under construction

On the technical side, the lack of space in the carriages disallowed back-of-house facilities. Moreover, during the tender consultation process, misgivings were expressed concerning fire risks and the lack of escape routes if there would be gas-fired cooking services in the carriages. Therefore, it was decided to locate all back-of-house facilities, including all kitchens, in the Kruger Station, the Bridge House, and the Distribution Center.

#### b) Interior Design

The team had to work with structural challenges, and a combination of size constraints and compactness. Once the *interior* design work<sup>15</sup> commenced, the project team quickly realized it was facing a number of challenges:

1. The client brief stipulated a "luxury feeling". To meet *luxury standards* for hotel guest rooms, the carriages could only be divided into 2 suites each, instead of the 4 compartments on the old trains. In addition, the client brief specified that no plastic was to be used.
2. To satisfy *comfort levels*, the room size needed to be expanded. To this end, the carriage corridors were deleted and incorporated into the guest rooms. In addition, *blisters* were added to the sides of the carriages to expand the room space. This involved pushing wall sections out from the sides of the carriage to fit larger beds and allow for larger bathrooms. The depth of the *blisters* was restricted, to miss the bridge girders.
3. To take advantage of the *dramatic bridge top views*, installation of large, full-height windows was required.
4. To provide *guest room access*, it was necessary to add a generous external walkway along the tracks on the upstream side of the carriages. This required complex engineering because in adding the walkway the bridge structure could not be damaged. At the same time, it had to be possible to remove it and restore the bridge to its original state at the end of the concession.

<sup>15</sup> SA Decor and Design. (2019, August 25). *Afrocentricity At The Centre of Kruger Shalati Train On The Bridge*. SA Decor & Design. [www.sadecor.co.za/interior-design-blog/featured/afrocentricity-at-the-centre-of-kruger-shalati-train-on-the-bridge/](http://www.sadecor.co.za/interior-design-blog/featured/afrocentricity-at-the-centre-of-kruger-shalati-train-on-the-bridge/)



Source: Keith Stannard

Exhibits 13 and 14: Welding panels and blisters to increase interior floorspace



Source: Andrea Kleinloog

Exhibit 15: Blisters with windows added to the side of the carriage

Adding the external walkway along the bridge provided two additional benefits:

1. The Shalati Bridge is the emergency evacuation route for the Skukuza Camp residents in case of a flood or other disaster, but it had some known safety issues. Permanently positioning carriages on the bridge makes this escape route much less viable, but the new walkway resolves both the escape and pre-existing safety issues.



2. A site survey showed that electricity, water, and sewerage services could be run within an existing service channel between the tracks along the bridge and underneath the external walkway. Sewerage was especially difficult to deal with and required making and installing removable, sealed holding tanks and pumping equipment on the bridge piers.



Source: Andrea Kleinloog

Exhibit 16: The original emergency evacuation route



Source: Keith Stannard

Exhibits 17 and 18: The service channels during installation on the western side of the train



### c) *Rehabilitating the Carriages*

This section describes the sequence and the process from sourcing abandoned rail carriages at a shunting yard to winching the refurbished carriages into their permanent positions on the bridge. Originally, the plan was to refurbish 4 carriages at a time and to deliver these to the site on a 4-week cycle. Because of constraints (space, manpower and others), design changes, and extra customizations on a carriage-by-carriage basis, this proved not possible. Each individual carriage took approximately 10 weeks to complete on average. In reality, because of the staggered approach adopted, it took 15 months for the overall process from start to finish to complete all 13 carriages.

#### a. *Partner Selection*

A Special Purpose Vehicle (SPV) company was assembled as a Joint Venture (JV) to undertake this project under a lumpsum contract. The 2 individual principals making up this JV were former government officials working in the railway environment, with a keen interest in rail-related developments. As such, they kept track of rolling stock in shunting yards around South Africa and had become aware of such a yard in the town of Ladysmith in Kwazulu Natal Province, just 400km southeast of Johannesburg. This yard held approximately 30 carriages in various states of repair.

Chance had it that these 2 individuals had been working on another project to reactivate a redundant railway line for tourism in Eastern Cape Province. For this purpose, they had acquired the stock at the Ladysmith shunting yard. Since that project was experiencing delays (due to regulatory hurdles), the JV came to the Kruger Shalati project with this stock in hand, thereby short-circuiting the procurement process.

In another fortunate opportunity and good fit, the JV was able to partner with an industry colleague that owned and operated a specialist company that builds specialist road trailers. This specialist company owned a:

- *Steel workshop* with gantry hoists and other specialist equipment on the outskirts of Johannesburg, and a
- *Wood workshop*, a 3,000m<sup>2</sup> facility with a 15m. high roof and gantries used to store trailers just 5km. from the steel factory. Half of this space was prepared with a concrete floor, allowing for 9 carriages to be lined up inside in rows and allowing the side-lifting trailer to maneuver into the space.



Source: Keith Stannard

*Exhibit 19:* Steel workshop



Source: Keith Stannard

*Exhibit 20:* Wood workshop

#### b. Logistics

The JV purchased a multi-axle hydraulic low bed trailer with side-lifting, extendable arms from New Zealand to transport the carriages from the shunting yard to the steel workshop, then to the wood workshop and finally to the Shalati Bridge. To lift the carriage on and off the low bed trailer, the train couplings were removed and their center mounting points were adapted to be the lifting points for the cranes.

The project team engaged a specialist to arrange special transport permits and facilitate:

- **Registration:** The trailer is not a conventional low bed trailer but fits onto an intermediate wheelset that then connects to the truck tractor. It becomes a complicated rig, involving 3 vehicles, that must be registered with the Department of Transportation (DOT), Road Transport as a unit.
- **Restrictions:** The project team had to manage weight issues for the completed carriages, as well as weight restrictions per axle, height, and width restrictions on specialist trailers.
- **Regulations:** No special transports are allowed on weekends, public holidays, when it is raining, and on certain roads and routes. The truck must be escorted by vehicles in the front and back.

Transportation of the “prototype” carriage was proof of concept and took 3 days. It exposed height and weighbridge issues, cut corners and damaged bridges. Delivery of the last carriage only took 1 day and 4 hours.



Source: Keith Stannard

*Exhibit 21:* The multi-axle hydraulic low bed trailer with side-lifting, extendable arms

### c. Shunting Yard

A contractor in Ladysmith gutted and stripped down the selected carriages to their bare metal shells, and disposed of the internal compartments, gangways and scraps. Then, the wheel bogies were separated from the carriages, further reducing the weight, as well as the height for transportation to the steel workshop.



Source: Keith Stannard

*Exhibits 22 and 23:* Carriage, gutted and ready for internal restructuring

### d. Wheel Bogies

Each carriage was separated from its double-axle wheel bogies so that they could be reconditioned (i.e., checking the bearings, cleaning, painting and refurbishing). Each set of wheels was specific to a carriage and they were not interchangeable. Therefore, all sets of wheels were numbered and transported separately, to be laid out on the tracks, ready to receive the completed carriages in the right sequence.



Source: Keith Stannard

*Exhibit 24:* Carriage bogies, stripped and reconditioned



Source: Keith Stannard

*Exhibits 25 and 26:* Carriage bogies delivered separately to site and laid in sequence on the track

#### e. Prototype

Since the entire project concept centred around using authentic train carriages as luxury hotel guest rooms, one of the critical success factors of the project was the decision to develop a prototype, as “there are too many unknowns in this kind of project...”. Therefore, it was decided to first build one prototype carriage and get it into position on the bridge to test the entire production, transportation, and installation process. Running a prototype added seven months to the overall program, but was critical to unearthing “unknown unknowns” and understanding the challenges and constraints these posed. Following are seven examples.

##### i. Access Constraint

The width of the train door is 65cm. only, making it a challenge getting equipment and materials in and out of the carriage for set-up, maintenance, and renovations. As a result, the *default line* in development thinking became “quality and durability of finishes”. This included anything that was finite and could not easily be redone: structural shape and integrity of each carriage, including windows, doors, plumbing and light positions.

##### ii. Bathroom Orientation

The interior design drawings would indicate the position of the bathtub, the drain and waste trap with a plug. Upon positioning the tub in the carriage in accordance with the drawings, it turned out that there was a beam at 1.5m and a major steel structural member right beneath the hole. These were integral to holding the carriage together and so the bathroom orientation had to be changed.

##### iii. Main Bedroom Window

After positioning and stabilizing the first carriage on pedestals in the wood workshop, the team went in to measure the carpentry and get prepared to start paneling. The team then realized that the main feature picture window in front of the double bed was too low; while on a bridge, one tends to look more down than up. The decision was made to increase the size of the window. This involved making structural modifications by introducing steel elements to reinforce the structural frame, as the team was cutting almost into the roof structure.

##### iv. Environmental Control

From the beginning, it was understood that the carriages would have to be extensively water sealed, insulated (150mm.), and fitted with air-conditioners because of the high summer temperatures at the site. Moreover, they needed to be fitted with insect- proof mesh and baboon-proof screens to ensure the safety and comfort of guests. These were not issues in the much earlier train tours of the park but were significant concerns for the proposed target guests for the new hotel. Retrofitting such materials into the carriages was identified as being especially problematic.

##### v. Original Design Intent

Train carriages are designed to *bend and flex* as they move along railway tracks. In addition, they *varied in size* by up to 50mm., making planning difficult. These physical limitations were resolved by designing tolerances as follows:

- *Bending and Flexing:* Tight-fitting hard surface finishes, (e.g., large floor tiles, permanent wall-to-wall mirrors, and cupboards) could not be used, because these would be damaged during transportation to the bridge. Instead, mosaic bathroom tiles, rugs, adjustable wooden wall panels, etc. were used for maximum flexibility.

- *Varying Sizes:* Fixed fittings had to be size adjusted from carriage to carriage, significantly increasing the refurbishment work. This was remedied by using timber. Interior designs incorporated various smaller, easily removable items to simplify the on-site final fit-out work. This has the added benefit that future room renovations should be relatively straightforward, especially as structural changes are not possible.
- vi. *Bridge Span Movement:* Daily changes in temperature cause thermal expansion and contraction of the bridge by up to 40mm. This figure is the potential extent to which each of the bridge spans moves and therefore the tracks underneath each car. To remain securely connected to the services, these needed to be accommodated via sliding or flexible couplings to all service ways. The interesting challenge was that each car was slightly different in size from the next and had to be measured individually. This is interesting in that "modular" implies that fitments joinery could be premanufactured in numbers for install. This proved not strictly the case, with tolerances having to be addressed and provided for or specifically cut to measure per car.
- vii. *Maintenance:* To allow easy dismantling for maintenance and renovation, floor coverings, wall coverings, décor and furnishings had to be removable. Everything was designed to be "steel supported and boltable". Click-in-place fixtures, furniture, and equipment was used. Bedside tables were electrically wired, so that the sockets and lamps moved with the tables.

To avoid unnecessary delays, the project coordinator insisted that the contractor not wait until the prototype was completed before commencing construction of the remaining 12 carriages. As a result, by the time the project team signed off on the prototype, carriage no. 5 was already in production. This meant that some re-work was required. This slowed the production of carriages 2, 3 and 4, but ensured that the production line remained in process to optimise production time.

In parallel with the prototype, the rail spur line and the first sections of the external walkway were installed. At the same time, the holding tanks and service channel were manufactured and installed. Next, the first carriage was transported to the site and mounted onto its bogies on the rail spur line. Winches were used to drag the carriage into its final position, and it was permanently locked into place using wheel chocks clamped to the tracks. Lastly, utilities and other services were connected and the steps to the guest room entry doors were fitted.



Source: Andrea Kleinloog

*Exhibits 27 and 28:* Installation of the external walkway

A specific challenge (and potential bottleneck) the project team had to manage and coordinate was between the bridge and carriage teams, in that bridge access was from the South end, but carriage placement had to start from the North end. Key to this was the walkway attached to the Western side of the bridge. Until its installation, the only access down the line was via a narrow tread plate between the tracks in the centre of the bridge. As a result, all services were thus fixed onto the bridge from South to North, comprising of potable water, fire water, and the waste water return from the 9 sewer tanks on each of the bridge support piers. These all had to be in place and pressure tested before the carriages were in place, as access would otherwise not be possible. Electrical, data and fire sensor cables were installed sequentially under the guest access walkway with access hatches, as work progressed

Southwards. The cars were then connected progressively (*main power supply and data last*). Because each carriage was fully reticulated to a single connector, temporary power was always available to support testing and commissioning (e.g., FF&E, hot water cylinders, AC, lighting, etc.), whether on the spur or on the bridge.

While in the factories in Johannesburg, the project team identified a number of design deficiencies in the prototype, including:

- The windows had to be further enlarged to fully appreciate the dramatic views.
- The bathroom floors needed dropping to increase headroom.
- Some furniture arrangements required adjusting.

Once these and other significant prototype deficiencies had been identified and all the design challenges had been addressed, the design drawings were updated accordingly and communicated to the steel and wood workshops. Please refer to *Appendix B* for the TOB interior design drawing of a typical carriage guest room. The remaining carriages, including one with a Universal Accessibility (UA) guest room, accessible with a remote-controlled wheelchair lift from its end, rather than from its side, were then refurbished and delivered to the site sequentially in the order that they were to be positioned in on the bridge. As part of that sequence, the lounge carriage was prepared, which had to be perfectly aligned with the suspended pool, and therefore became the starting point for plotting the position of all other carriages. The mandatory dependency (datum) for positioning the first and furthest-most carriage was to ensure that when the lounge carriage was positioned, it was centred with the pool; it would have been virtually impossible to have to relocate 8 carriages down the line at that point. Please refer to *Appendix C* for the TOB interior design drawing of lounge carriage.



Source: Kruger Shalati Pty Ltd.

*Exhibit 29:* The lounge carriage and suspended pool

#### f. Steel Workshop

Here, the team cut window openings, made structural reinforcements, fixed panels and spray painted the carriages, then moved the carriage to the wood workshop. One of the constraints of this facility was the maximum capacity of 5 carriages, which were rotated in and out on a 4 to 5 week cycle. The project encountered a serious challenge when it ran out of steel, during Covid-19, and a significant price increase once steel became available again.



Source: Keith Stannard

Exhibits 30 and 31: The first car in the steel workshop with bogies separated



Source: Keith Stannard

Exhibits 32 and 33: Setting out for the cut



Source: Keith Stannard

Exhibits 34 and 35: Picture window openings cut and framed

g. Wood Workshop

Upon arrival, the carriages were manoeuvred into position and placed on pedestals, and measured for carpentry, panelling and fit-out by three specialist teams:

- i. *Structural Team (Lumpsum Contract)*: Installation of wall studs and panels, framing, insulation, flooring, and the structure for the vaulted ceilings.
- ii. *Woodwork Team (Lumpsum Contract)*: Finetuning of the actual wall panels and architraves, fitting aluminum windows into openings, hanging doors (custom-made for each carriage by an artisan) into doorframes, and fitting baths.
- iii. *Interior Fit-out Team (Client Resource)*: Tiling, wallpapering, fitting-out of sanitary ware and amenity trays. The interior design for the carriage guest rooms incorporated all Furniture, Fixtures and Equipment (FF&E), and part of the Hotel Operating Equipment (HOE). The original plan was to entirely fit out each guest room before being transported to the site. However, this proved impractical and after transportation of the “prototype”, most of the loose furnishings were transported to the hotel separately and fitted into the carriages there. This was done partly because of fears of damage during transportation, but also to improve the storage security for the loose fittings.



Source: Keith Stannard

Exhibit 36: Exterior finishing



Source: Keith Stannard

Exhibits 37 and 38: Internal structure before closure and panelling ready for wood finishing





Source: Keith Stannard and Andrea Kleinloog

*Exhibits 39 and 40: Installation of Furniture, Fixtures & Equipment*

The key challenge included managing the overlap coordination of the various trades, some of which had critical interdependencies.

d) *Testing and Commissioning*

Each carriage was regularly inspected by the architectural team<sup>16</sup> during its refurbishment. Upon completion of the refurbishment, the electrical, plumbing, and waste services were tested before each carriage was released for site delivery. In addition, cursory testing of the water sealing of the carriages was carried out.

Climate control created complications beyond normal projects because Johannesburg is located at 1,760 meters above sea level, a relatively high altitude with very dry air. By contrast, the hotel site is in a lowland area below 300 meters above sea level, with relatively high humidity and summer temperatures rising up to 46° Celsius. This made it difficult to factory test the effectiveness of the carriage air-conditioning systems for climatic endurance. The air conditioning was installed on the spur line prior to placement on the bridge, to enable the use of a local vendor and service provider, rather than requiring technicians to travel from Johannesburg. During transportation, the project team did experience some cracking and breaking due to the carriages expanding as the temperature rose.

e) *Transportation and Installation*

As explained, the carriages were completed in the order that they were to be positioned on the bridge. Upon completion, each carriage was transported by road to KNP. Because of the size of the rig, SANParks only approved one access point into KNP, and imposed a special escort. Once the trailer was aligned with the spur, the carriage was hoisted back onto its original wheel bogies on the rail spur line and winched into final position on the bridge.



Source: Keith Stannard

*Exhibits 41 and 42: The first carriage being hoisted back onto its original wheel bogies on the rail spur line*

<sup>16</sup> Hesse Kleinloog. (2019). *Kruger Shalati*. [www.hkstudio.co.za/kruger-shalati](http://www.hkstudio.co.za/kruger-shalati)

One anecdote of a particular project issue is that the special transport vehicle blew a tire in the middle of a bridge over a crocodile-infested low-level river in the middle of the park, with repairs only possible from the river. The crew was advised to remain inside the cab, while it took several hours for the repairmen to reach the site and fix the vehicle in dangerous conditions with lions about.



Source: Keith Stannard

*Exhibit 43:* The first carriage being winched into position on the bridge

Once each carriage was in position, it was connected to the utilities and the sewerage system.

- *Power:* KNP has an electricity grid, but the hotel just uses it for backup. The 400kW of photovoltaic panels the hotel installed on the roofs of the Distribution Center and car park, fully provide for its electrical needs, making the hotel self-sustaining, and increasing its environmental credentials while simultaneously reducing the additional load on the park's infrastructure.
- *Green, Grey, and Black Water:* The hotel also taps into the park's main water supply, sewerage, and waste treatment infrastructure. The carriage guest rooms incorporate water and waste pumping technologies based on the facilities in caravans and modern long-distance trains. Efforts were made to ensure that all piping remains hidden but can be easily removed from the bridge at the end of the concession. In addition, the nearby Skukuza Airport had to be provided with fresh water via an existing pipe over the bridge which the project was required to upgrade.

Similarly, the room entrance from the walkway was finalized, and all the carriage equipment was tested. It should be noted that the repeating structural "wavelength" of the bridge arches is different from the somewhat variable carriage lengths. Thus, each carriage accessway and services channel section was different and unique, as was the balcony of each carriage.



Source: Kyle Lewin

Exhibits 44 and 45: Finished interior

f) *In-situ Construction and Renovations*

In parallel with the guest rooms and lounge carriages being repurposed and refurbished, the Kruger Station was renovated, and the new Bridge House and bridge components were built:

- *Kruger Station:* The facilities underwent an extensive renovation to house a family restaurant, full-service bar, coffee shop, grab 'n go, edutainment, a 360° cinema, kids' corner and merchandise outlet. *The facility was re-opened before the opening of Kruger Shalati.*



Source: Andrea Kleinloog and Keith Stennard

Exhibits 46 and 47: Renovation of Kruger Station and completed project

- *Bridge House:* This facility was built using standard portal frames. This method is widely used in South Africa and was adopted for the design, but to a significantly higher standard of internal fit-out (e.g., the building was extensively insulated for guest comfort). This type of building fits in with the local architectural vernacular very well and it can be built quickly and efficiently. In addition, the semi-skilled labor needed for most of the work is readily available.



Source: Keith Stannard and Kyle Lewing

Exhibits 48 and 49: The Bridge House interior and exterior

- *Swimming Pool:* The double swimming pool, made from repurposed cylindrical water tanks, were installed adjacent to the Bridge House.



Source: Andrea Kleinloog and Mia Louw

Exhibits 50 and 51: Assembly of the double swimming pool and completed project

- *Bridge Components:* A third factory, located in Nelspruit ( $\pm 125$ km. from Kruger Shalati) built the external walkway for the bridge, the services channel segments and the pier-top sewerage holding tanks, as well as the deck and suspended swimming pool for the lounge car. These components were then progressively transported to the site and installed onto the bridge. This project work had to be coordinated with the completion of the carriages so that all components could be installed in the correct order (e.g., the relevant walkway and services channel sections had to be put in place after the corresponding carriage was positioned), including the bridge deck and pool.

g) *Fit-out and Set-up*

The carriages were refurbished and transported complete with their hard furnishings. As explained, most of the loose fittings, furniture, and soft case goods were transported separately to a warehouse in Skukuza for set-up in the carriages on the bridge to reduce the risk of damage during transportation. These were installed by the hotel pre-opening team before the carriages were winched to their final position. This helped to increase their understanding of, involvement in, and commitment to the hotel.

h) *Pre-opening*

A successful new hotel opening is achieved by ensuring simultaneous technical, operational, and commercial readiness before opening the asset for paying guests:

- *Technical readiness* pertains to ensuring the new building is physically fit for associate and guest occupancy (e.g., testing, commissioning, defect rectification).

- *Operational readiness* pertains to ensuring the building and associates are ready to deliver optimal guest experience (e.g., recruitment and training of all employees, purchasing of Hotel Operating Equipment & Supplies).
- *Commercial readiness* pertains to ensuring optimal business ramp-up (e.g., sales and marketing, e-distribution, revenue management).

To ensure opening readiness, the hotel development project manager was appointed as the hotel pre-opening general manager to plan and execute the pre-opening activities and transition from project to ongoing hotel operations.

The pre-opening processes included:

1. *Recruitment and Training*: Most of the hotel operations staff were recruited locally from the population of the traditional landowners, as part of the hotel's commitment to the local community. The project's hotel partner assisted with the development of the hotel's Standard Operating Procedures, Job Descriptions, and training plan, and delivered the pre-opening training.
2. *Purchasing*: The carriages were refurbished and transported complete with their hard furnishings. The remaining FF&E and several HOE items were shipped separately to the site for installation by the hotel pre-opening team. To set-up the hotel's Hotel Operating Equipment and Supplies (HOES) supply chain, the hotel partner leveraged its existing supplier relationships.
3. *Outsourcing*: Various local businesses were invited to partner with the hotel to provide services.
  - a. Traditionally, hotels and resorts have often incorporated laundry facilities, but one modern trend is to outsource this operational activity. Nearly all accommodation facilities in and around Skukuza Camp, including Kruger Shalati, use commercial laundries in the town of Hazyview, which is approximately 60km away. This has the added benefit of moving laundry wastewater processing outside the park and reduces the workload on the local sewerage treatment plant.
  - b. A local bakery was invited to use the hotel's kitchen and provide all the hotel's bakery products. This is enabling the business to expand capacity while learning additional business skills. It is hoped that eventually, the bakery business will be able to expand into its own premises and serve baked goods to other nearby accommodation and other venues, in addition to the hotel.
4. *Sales & Marketing*: Because the hotel is within the KNP, it was able to leverage off the Park's existing sales and marketing platform, as well as the systems of its hotel- and tour operator partners. Nonetheless, the hotel's dedicated website had to be developed and tested prior to opening.
5. *Finance & Licensing*: Because the carriages are stationary, they did not have to be approved to railcar standards, which are significantly more stringent than regular building standards. Moreover, the park management is the approving authority for structures within the park and so the approvals were obtained as part of the tender submission and acceptance process. Therefore, separate approvals were not required.
6. *Set-up*: The pre-opening team installed the remaining FF&E and several HOE items, which were shipped separately to the site. The team then performed the usual final cleaning, testing of the in-room systems equipment (electrical, plumbing, and drainage), and set-up of guest amenities and supplies. Last, the team conducted a final inspection before approving each room fit for paying guest occupancy.
7. *Opening*: The decision was made to soft open the hotel with 8 carriages plus the lounge carriage with elevated pool, allowing the hotel to start trading before Christmas 2020.

## V. HOTEL OPERATIONS STAGE

### a) *Post Opening*

The remaining carriages were delivered staggered and the remaining non-carriage hotel rooms near the Bridge House were completed post-opening.



Source: Mia Louw

Exhibit 52: The non-carriage hotel rooms

#### b) Operations and Maintenance

The unique nature of the hotel presented several operational and maintenance challenges. For example:

- The Environmental Clearance requires an independent ECO to conduct inspections of the property for the entire working life of the operating hotel (initially 3 to 4 times per year).
- Because no cooking facilities were permitted within the train carriages, all food must be brought from the Bridge House or Kruger Station. This necessitates additional staff to move food & beverage and other materials over quite long distances between the various hotel front-and back-of-house spaces.
- Because the guest room access walkway is only wide enough for one small, motorized golf cart, a lot of luggage carrying, and maintenance work involves moving items by hand. This is another reason why various FF&E items in the carriages were designed to be small and easily moved and are not permanently fixed into place.
- Because the bridge deck is 15+ meters above the river, hidden (and removable) cleaning platforms had to be incorporated into the undercarriages to safely clean the external surfaces of the carriage windows. In addition, the maintenance staff needed special training and equipment for working at height.
- The use of pesticides and biocides is not allowed inside the park, requiring housekeeping to consider natural and non-toxic alternatives to kill cockroaches and other pests.
- Food waste is sorted onsite and then moved off-site. The hotel meets minimum SANParks standards and is working with the ECO to exceed these standards.
- The elevation above a pristine riverine environment required very specific measures to be put in place to mitigate items dropping or blowing into the riverbed. Retrieval of items requires an armed SANParks guard to accompany the clean-up team.

## VI. CONCLUSIONS

This paper started by stating that two key drivers of this modular construction-with-a-twist project were authenticity and a strong ESG ethos.<sup>17</sup> Here, the authors review the achievements and lessons learned from this novel hotel development project.

It is widely accepted that refurbishing equipment and buildings tends to be more difficult and expensive than building a new structure from scratch. However, the *Kruger Shalati: The Train on the Bridge* was a modular construction project by default, as railway carriages are by definition modules, given the extreme difficulty and complexity of building a high-quality hotel in such a challenging location with traditional construction methods. The extensive EIA required, and developmental constraints and operational conditions imposed on the hotel signal the strong desire of the relevant authorities to protect the natural, cultural, and economic value of the KNP. The developer has also made considerable efforts to engage with and support the local community during the development of the hotel and its ongoing operations.

Regarding authenticity, the final exterior product does mirror what the carriages would have looked like in the 1930s and 1950s, making the extreme efforts of all stakeholders worthwhile.

<sup>17</sup> Getaway. (2020, November 11). *Kruger Shalati Train on a Bridge Hotel celebrates sustainability*. Getaway Magazine. [www.getaway.co.za/travel-news/kruger-shalati-train-on-a-bridge-hotel-celebrates-sustainability/](http://www.getaway.co.za/travel-news/kruger-shalati-train-on-a-bridge-hotel-celebrates-sustainability/)

*Kruger Shalati: The Train on the Bridge* has certainly raised the bar for developers of future novel hotel concepts. What were the major challenges encountered by the project team, the key success factors, best practices, and lessons learned from this project?

According to the *Chief Executive Officer*, the major challenge was the fact that such a project had not been done before and therefore there was no one to advise the project team on *what* to do and *how* to do it. "There were so many challenges on so many different levels, and the team was learning while the project was progressing. The biggest challenge was the physical engineering of the train: building it outside and then getting it onto the park. Due to the ecologic sensitivity of the park, the logistics of transportation are impressive. When can the truck come in? Where can the truck come in? How will the (massive) truck create the least amount of disturbance?"

According to the *Environmental Impact Assessment Practitioner*: "From the environmental perspective, do not assume that despite of the development happening mostly in a brownfield site, the broader context of a development in a national park means that the assessment needed to be more thorough than originally expected, particularly from the authorities' perspective."

According to the *Project Coordinator*, the most critical success factor was the decision to develop the prototype, and getting the first carriage and various sequential elements right, while starting on the second carriage before the prototype was fully completed, to avoid delaying the production process adversely. He observed that: "because of complexity and difficulty, the project consisted of two-thirds development administration and one-third project delivery." Another critical success factor was the fact the hotel management team and operator's technical services were involved "right from the get-go to help plan the many technical and design-related and operational interdependencies. This made for a very well-integrated, well-coordinated, well-communicated collaboration of every single key element."

According to the *Interior Designer*, one of the main challenges was scope management, due to the uncharted nature of the projects, resulting in an evolution of the brief under a catch-all contract. "People do not realize what it means to retrofit a train until you stick your head inside one." One of the main takeaways was on preconceived assumptions: "Don't assume! trains are waterproof, rigid, of identical size: they are not..." One of the key success factors was the operational input on the designs from the hotel operator: "How do you clean around the bathtub? How do you clean the windows on the outside?" "Designs must be a little bit forgiving, be flexible and adaptable."

According to the *Pre-opening General Manager*, the three main lessons for similar future projects are:

1. *Schedule & Budget*: Schedule: however long you *think* the project will take to be completed, double it. Budget: however much you *think* the project will need to be completed, triple it.
2. *Risk & Uncertainty*: Conduct a very thorough risk assessment and think of every possible "what if" scenario (e.g., happens if your Project Manager gets malaria?)<sup>18</sup> and build in contingency (i.e., does the budget include sufficient capital for events like Covid?). "Accept the unexplained unforeseen: it will happen!"
3. *Team*: "This kind of project takes its toll on a human being, so take care of the people and give them support."

The *authors* are of the opinion that two of the key success factor were the foresight to carefully select the strategic partners and project team members, and identify all key stakeholders at the beginning. The project team displayed all the hallmarks of good project management: strong leadership, excellent communication and strong emphasis on planning. Interestingly, the developer now has considerable expertise and the facilities to make building modules, which could be a significant future business opportunity.

<sup>18</sup> Fortunately the project manager is a well-salted South African who has experienced almost all the continent can throw at you...

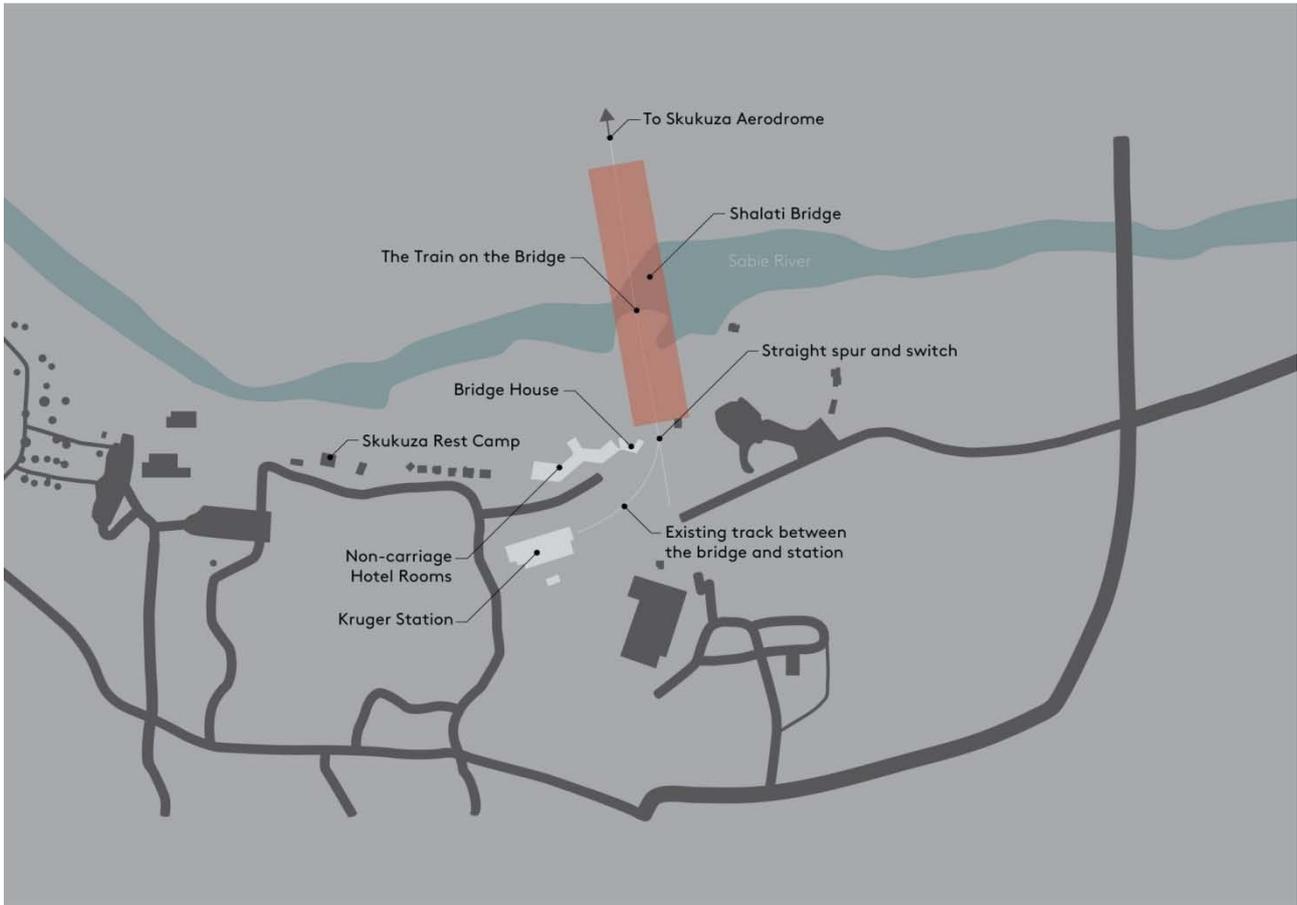


Source: Kruger Shalati Pty Ltd.

Exhibit 53: Kruger Shalati: the Train on the Bridge



APPENDIX A



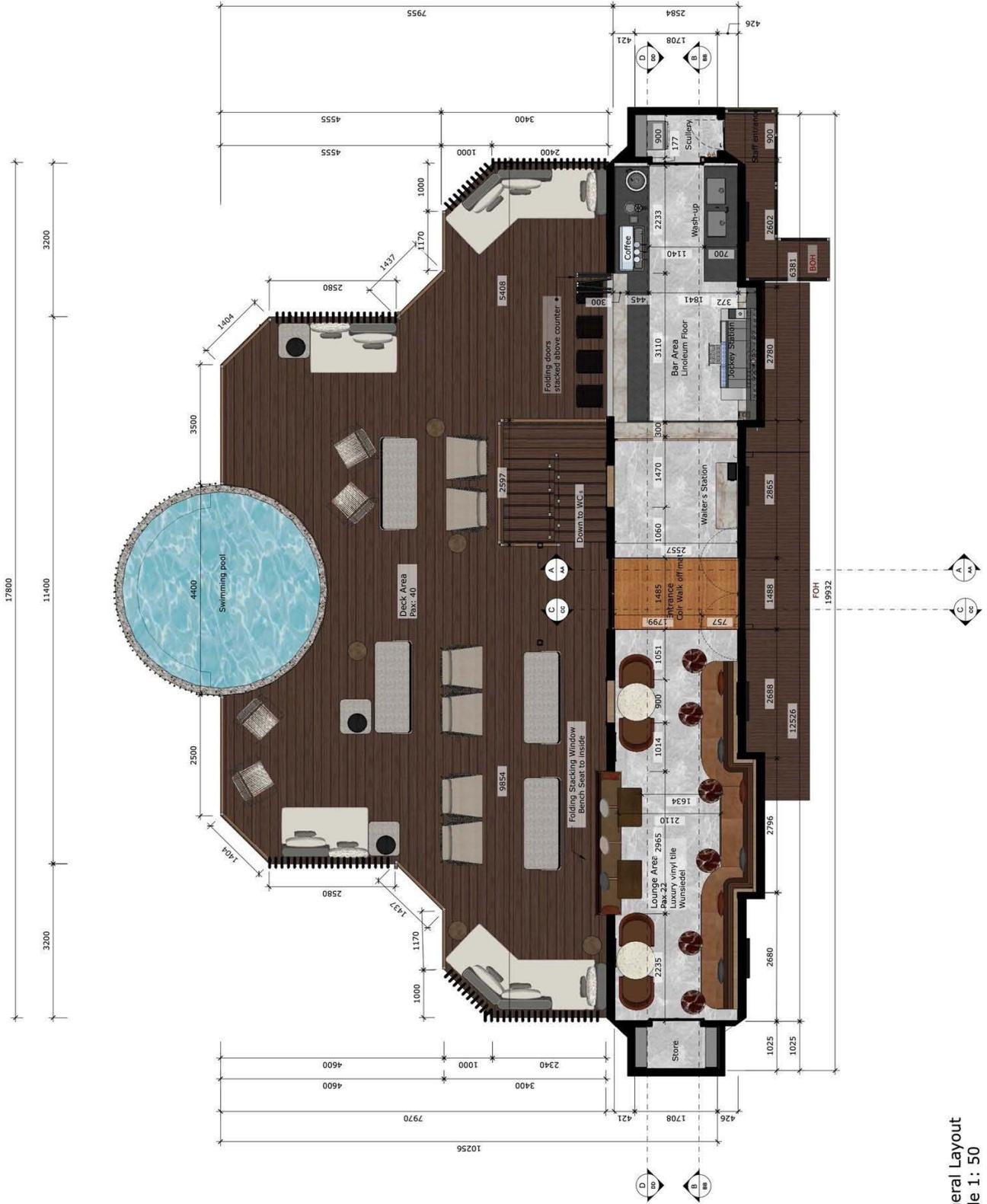
Source: Courtesy of HesseKleinloog Studio

Map of Skukuza Rest Camp, Kruger Station, and the Shalati Bridge





APPENDIX C

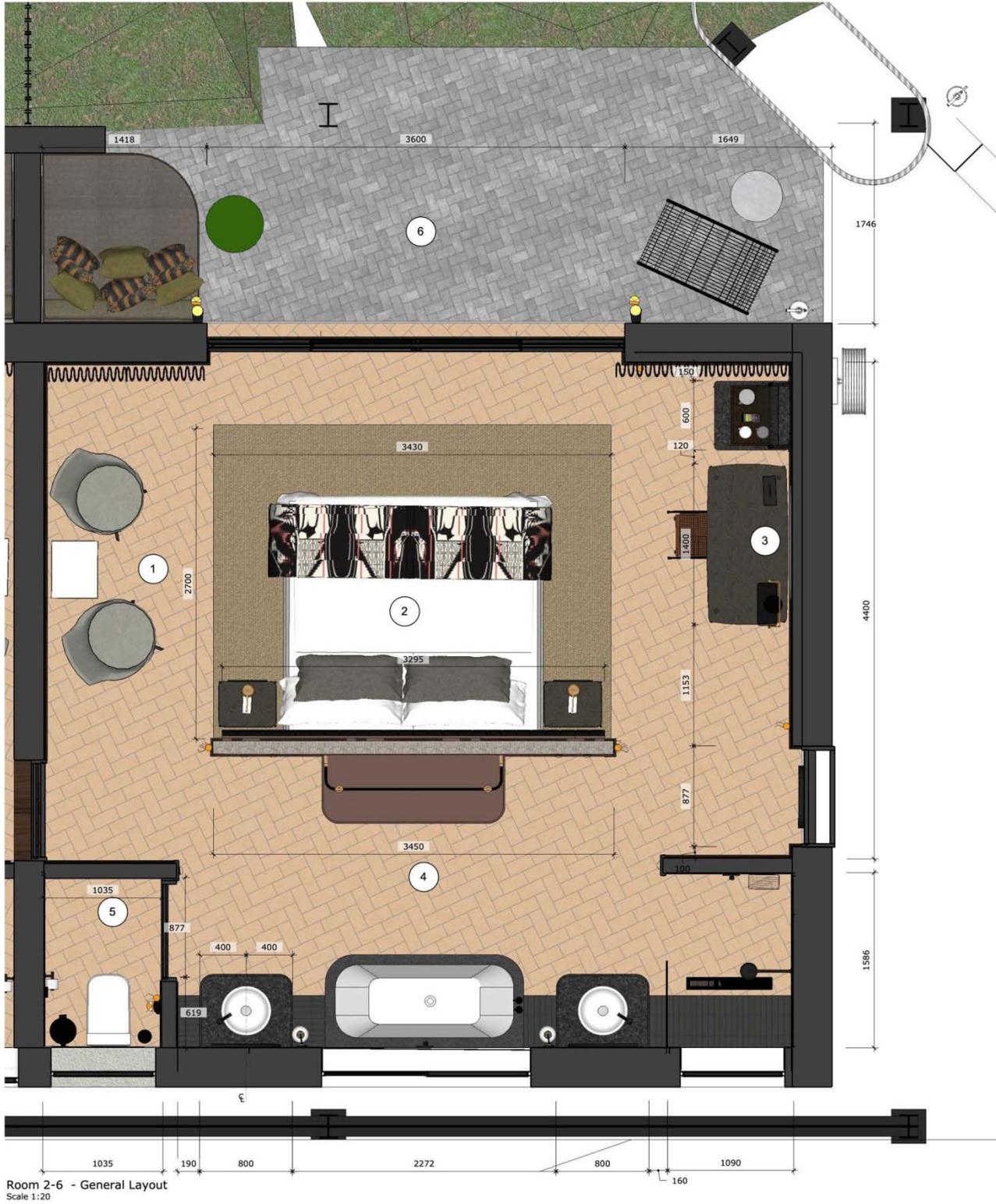


General Layout  
Scale 1: 50

Source: Courtesy of HesseKleinloog Studio

TOB interior design drawing of the lounge carriage

APPENDIX D



Source: Courtesy of HesseKleinloog Studio

TOB interior design drawing of a typical non-carriage hotel room



## ACKNOWLEDGEMENT

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## REFERENCES RÉFÉRENCES REFERENCIAS

1. Balt, M. (2019, July 1). *Project manager answers KNP train questions*. Lowvelder. <https://lowvelder.co.za/490727/project-manager-answers-knp-train-questions/>
2. Balt, M. (2029, July 13). *This train will go nowhere but reminds of the past*. Lowvelder. <https://lowvelder.co.za/554756/this-train-will-go-nowhere-but-reminds-of-the-past/>
3. Big on Wild. (2018, July 27). *History of the Kruger National Park - Part One*. <http://bigonwild.co.za/history-of-kruger-national-park-part-one/>
4. Getaway. (2020, November 11). *Kruger Shalati Train on a Bridge Hotel celebrates sustainability*. Getaway Magazine. [www.getaway.co.za/travel-news/kruger-shalati-train-on-a-bridge-hotel-celebrates-sustainability/](http://www.getaway.co.za/travel-news/kruger-shalati-train-on-a-bridge-hotel-celebrates-sustainability/)
5. Great Limpopo Transfrontier Park. (2021). *A Major Dynamic Conservation Initiative*. [www.greatlimpopo.org](http://www.greatlimpopo.org)
6. Hesse Kleinloog. (2019). *Kruger Shalati*. [www.hkstudio.co.za/kruger-shalati](http://www.hkstudio.co.za/kruger-shalati)
7. Kruger Park. (2021). *Modern History of Kruger National Park*. [www.krugerpark.co.za/Krugerpark\\_History-travel/kruger-national-park-modern-history.html](http://www.krugerpark.co.za/Krugerpark_History-travel/kruger-national-park-modern-history.html)
8. Kruger Shalati (PTY) Ltd. (2021, September 7). *Kruger Shalati the Train on the Bridge*. [www.krugershalati.com/](http://www.krugershalati.com/)
9. Noordzy, G., & Whitfield, R. (2021a). The New Hotel Development Project Life Cycle. *The Journal of Modern Project Management*, 8(3), 89–99. <https://doi.org/10.19255/JMPM02508>
10. Noordzy, G., & Whitfield, R. (2021b). Modular Construction, An Important Alternative Approach for New Hotel Development Projects. *The Journal of Modern Project Management*, 9(2), 217–235. <https://doi.org/10.19255/JMPM02715>
11. SA Decor and Design. (2019, August 25). *Afrocentricity At The Centre of Kruger Shalati Train On The Bridge*. SA Decor & Design. [www.sadecor.co.za/interior-design-blog/featured/afrocentricity-at-the-centre-of-kruger-shalati-train-on-the-bridge/](http://www.sadecor.co.za/interior-design-blog/featured/afrocentricity-at-the-centre-of-kruger-shalati-train-on-the-bridge/)
12. South African National Parks. (2021.) *Kruger National Park*. [www.sanparks.org/](http://www.sanparks.org/)
13. UNESCO. (2001). *Kruger to Canyon Biosphere Reserve, South Africa*. <https://en.unesco.org/biosphere/africa/kruger-to-canyon>
14. Wiley, M. (2020, December 16). *Look inside a luxury hotel made of vintage train cars that sits atop a bridge in South Africa's largest national park*. Insider. <https://www.insider.com/kruger-shalati-hotel-on-bridge-south-africa-kruger-national-park-2020>
15. Yin, R. K. (2002). *Case Study Research, Design and Methods* (3rd ed.). Newbury Park, Sage Publications.
16. Zunckel, K. (2018). *Kruger Shalati, Environmental Assessment Report and Environmental Management Programme Report*. Zunckel Ecological + Environmental. <https://zunckelecological.wordpress.com/resources/>

## Abbreviations

DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DOT	Department of Transport
DSAC	Department of Sport, Arts and Culture
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
ESG	Environmental, Social, and Governance
FF&E	Furniture, Fixtures & Equipment
HIA	Heritage Impact Assessment
HOES	Hotel Operating Equipment & Supplies
HSA	Historic Structure Assessment
JV	Joint Venture
KNP	Kruger National Park
PPVC	Prefabricated Prefinished Volumetric Construction
SAHRA	South African Heritage Resources Agency
SOP	Standard Operating Procedure

SPV	Special Purpose Vehicle
PPP	Public-Private Partnerships
TIA	Traffic Impact Assessment
TOB	Top of Beam
UA	Universal Accessibility
VIA	Visual Impact Assessment

