MAKERERE UNIVERSITY

COLLEGE OF ENGINEERING DESIGN ART AND TECHNOLOGY

SCHOOL OF THE BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION ECONOMICS AND MANAGEMENT

MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT

8202 PROJECT REPORT

CIVIL WORKS FOR THE REHABILITATION OF ISHAKA – KATUNGURU ROAD (58KM)

TECHNICAL REPORT

BY

DOUGLAS KIZITO

2020/HD08/17213U

SUPERVISED BY

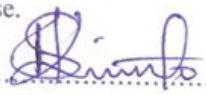
DR. ANDREW BWAMBALE

A PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTER OF SCIENCE DEGREE IN CONSTRUCTION MANAGEMENT OF THE COLLEGE OF ENGINEERING DESIGN ART AND TECHNOLOGY OF MAKERERE UNIVERSITY.

MAY 2023

DECLARATION

I, Douglas Kizito declare that the content of this report is my original work with the exception of acknowledged citations and that it has never been submitted to any institution by any other person for any purpose.

Signature .....  .....

Douglas Kizito

2020/HD08/17213U

Date .....12/05/2023.....

APPROVAL

This work has been carried out under my supervision and is now ready for submission to the Department of Construction Economics and Management, under the College of Engineering, Design, Art and Technology of Makerere University with my approval.

Signature.....

Dr. Andrew Bwambale

Supervisor

Date: 14/06/2023

ABSTRACT

This report presents a comprehensive analysis of the author's role and observations as an on-site Contracts Manager; a sub-role to his appointment as a Project Quantity Surveyor on the Civil Works for the rehabilitation of Ishaka – Katunguru Road project.

The report begins by providing an overview of the Ishaka-Katunguru Road project, highlighting its significance in promoting regional connectivity and socio-economic development. It then delves into the specific responsibilities, lessons and challenges faced, including contract administration, risk management, and stakeholder coordination.

The conclusions drawn from this report highlight the importance of effective contract management in large-scale infrastructure projects.

It is anticipated that the information herein will contribute to enhancing contract management practices within the road construction industry and serve as a valuable resource for future projects.

DEDICATION

To Lydia Namuli, Derrick Mugerwa, Linda Nakanjako and Mrs. Mary Kabugo

ACKNOWLEDGMENT

First, I would like to thank the Almighty God for this opportunity to further my education.

I would like acknowledge all persons who have played a fundamental role in teaching me new things, career guidance, as well as availing opportunities to grow. I acknowledge in a special way the Mr. Emmanuel Kateregga (late) and Mr. Paulo Salgado, for believing in me.

I acknowledge my supervisor, Eng. Dr. Andrew Bwambale for allowing time to direct us in the course of this program.

Last but not least, I would like to thank my family for the relentless encouragement and support.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The following project report presents a comprehensive analysis of the construction management involvement of the author on the Civil works for the rehabilitation of Ishaka – Katunguru road project.

1.2 Project Background

The project stems from the recognized need to rehabilitate the existing transportation infrastructure, to address the growing demands of the region. The Ishaka - Katunguru Road is a critical corridor for the movement of goods from the industrious town of Kasese and the neighboring Democratic Republic of Congo. The region is also a stronghold of tourism attractions; notably Queen Elizabeth National Park and over 56 crater lakes making it a tourism hub with numerous hotels, guest lodges and other recreation facilities.

Prior to the commencement of this road project, the existing road infrastructure faced numerous challenges. The road was characterized by inadequate pavement conditions, limited capacity, and safety concerns, leading to increased travel times, and accidents. These issues posed significant hurdles to regional economic growth, hampering efficient transportation and hindering the movement of goods and services.

1.3 Project Objective

Recognizing the importance of rehabilitating the road network, Uganda National Roads Authority (UNRA) on behalf of the Government of Uganda initiated the rehabilitation of the dilapidated Ishaka-Katunguru Road. The primary objective of this project is to enhance the road's capacity, improve safety measures, and ensure reliable and efficient transportation along the corridor.

The project scope encompassed various aspects of road construction and infrastructure development. It involved widening the existing road to cater for shoulders as well, improving pavement conditions, enhancing drainage systems, improvement of Kazinga Channel bridge approach road, and implementing necessary safety measures. Additionally, the project included

considerations for environmental sustainability, and community engagement to ensure the project's alignment with local needs and regulations.

1.4 Contract Data

Project Title	Civil Works for Rehabibilitation of Ishaka – Katunguru Road (58Km)
Employer	Uganda National Roads Auntority
Engineer	MBW Consulting Ltd
Contractor	Mota-Engil Engenharia E Construcao Africa, SA
Financing	Government of Uganda
Notification of Award	March 17, 2017
Contract Signed	April 12, 2017
Commencement Date	June 20, 2017
Contract Duration	18 months
Defects Liability Period	12 months
Contractual Completion Date	December 31, 2018
Contract Price	UGX 103,852,641,242
Contract Payment Currency	100% UGX
Form of Contract	FIDIC Multilateral Development Bank Harmonised Edition

Table 1 Contract Data

1.5 Project Delivery Method

The traditional design-bid-build procurement system was used for the procurement of this particular project Mota-Engil Engenharia E Construcao Africa, SA, a Portuguese multi-national construction firm emerged the lowest best evaluated bidder.

The designs were the work of an in-house UNRA design team; whereas the supervision contract was awarded MBW Consulting Limited (referred to hereafter as the Engineer).

The form of contract adopted was Admeasurement.

1.6 Project Scope

1.6.1 Geographic Scope

The project traverses the western Uganda districts of Bushenyi and Rubiziri, starting from Ishaka town and terminating at the Kazinga channel in Katunguru.

1.6.2 Physical Works Scope

The project scope included the following works:

i. Site Establishment and General Obligations
ii. Road Maintenance Works
iii. Drainage Works
iv. Earthworks and Pavement Layers of Gravel or Crushed Stone
v. Bituminous Layers and Seals
vi. Ancillary Road Works

1.7 Author's Involvement

I played the on-site contract management roles on behalf of the Contractor, Mota-Engil Africa; and these included but not limited to the following:

- Drafting contractual correspondences to the Engineer and Employer
- Logging contractual issues that may give rise to claim
- Drafting contractual claims
- Authoring Monthly progress reports
- Logging the Contractor's site mobilization
- Certifying Interim Payments for all subcontractors
- Updating the works program and generating s-curves for the Planning Engineer
- Generating Interim Payment Applications for the Contractor

CHAPTER TWO: SITE SUPERVISION AND PROJECT CONSTRUCTION APPROACHES

2.1. Introduction

Site management refers to the process of overseeing and coordinating activities on a construction site to ensure the smooth and successful execution of a project. It involves the efficient utilization of resources, effective communication, and the implementation of safety and quality control measures. Key aspects of site management include: planning and logistics, health and safety, resource management, quality control, communication and coordination, then documentation and reporting.

This chapter will focus on the major construction activities undertaken on this project and how they were managed.

2.2. Site Possession

UNRA handed over the site to the Contractor officially on June 30th 2017. Prior to the handover, however the Contractor had taken it upon himself to establish a temporary office as base for different project preparatory activities such as locating suitable site for the quarry, a topographical survey of the existing road, locating suitable borrow sites, site camp construction among others.

2.3. Site Planning and Mobilisation

2.3.1 Site Camp

The Contractor prior to site handover had already secured land at Kyamuhunga village, midway the project road, for site camp establishment and was commencing with the works for the

Engineer's accommodation, Contractor's camp, materials yard, asphalt plant, stores among others. The location of the site camp was very strategic for the Contractor to operate at the optimum.

Figure 1 Road Condition before project commencement

Figure 2 Site Camp Establishment Works

2.3.2 Stone Quarry, Borrow sites and Damping Sites

Also prior to establishment the Contractor had secured a rock at Nyakabirizi village and negotiations were ongoing for several borrow sites for marram and dumping sites along the project road. Proximity of these sites would lower the cost of haulage of material.

The Contractor subcontracted handling of hazardous waste to another private waste collection company.

Figure 3 Rock Quarry Establishment works

2.3.3 Equipment Mobilisation

At commencement equipment mobilization was still on-going; the biggest lot of trucks, Excavators, a pulveriser and quarry plant parts were enroute from Namibia by land. The Contractor found himself in a situation where he had to rent equipment from suppliers in Uganda to kick start some activities.

Figure 4 Some of the Equipment Mobilised at Commencement

2.3.4 Personnel Mobilisation

The Contractor's personnel were recruited in a phased manner as and when they were required on the project. Consideration was given to the local community for most of the semi-skilled and unskilled labour jobs.

2.4 Construction Approach

The project physical works were subdivided into different work packages for efficient management and control. Each package was headed by a superintendent who reported to the General Foreman.

2.4.1 Forward Maintenance Works

The contract required the Contractor at commencement to give priority to maintaining the road which was in a dilapidated state to a motor-able state. The work mainly involved filling up potholes and clearing existing drainage channels.

Figure 5 Wheel Loader correcting a section during Forward Maintenance Works

2.4.2 Geotechnical Investigations

A nominated subContractor by the Client, TecLab Limited undertook geo-technical investigations within the first month of the project to allow the UNRA in-house design team finalize with the road design.

2.4.3 Relocation of Utilities

Several subContractors were brought on board for the purpose of relocating the utility services that were obstructing the right of way. The utilities included National Water and Sewerage Corporation (NWSC) water pipelines, electric lines, Uganda Telecom telephone lines as well as NITA data cables.

2.4.4 Clearing and Grubbing

This involved removing any plant and tree growths within the right of way and a few structures such as old mark stones and culverts.

Clearing and grubbing was carried out with the help of an excavator, dozer, wheel loaders and trucks within the areas out marked by the survey team

Figure 6 Clearing and Grubbing works using a D6 Dozer

Figure 7 Clearing on the slopes

2.4.5 Drainage works

Drainage improvement was done by constructing the flowing structures:

- **Cross Culverts**

Several of these were constructed in different sizes from 600mm - 1500mm diameter culverts. Box culverts were also constructed in some sections.

- **Side Culverts**

These were constructed at the intersections of adjoining roads to the main road and were mainly 600mm diameter culverts

- **Stone Pitching**

Open drains on the sides of the road were covered by well grouted stone pitching of 250mm thick stones. Stone pitching works were done after construction of the pavement layers.

- **Other Drainage Structures**

These included manholes, chutes, inlet and outlet concrete structures.

2.4.5.1 Formwork

Fabricated steel formwork was used to give the desired surface finish as well as to quicken the erection and striking off after concrete has set.

2.4.5.2 Concrete Casting

Concrete was premixed from the campsite and transported to the site in a concrete-mix truck for placing on-site. This ensured that the desired quality is met as well as making placement easy and fast.

2.4.5.3 Steelwork

Drainage structure steel bending was done at the campsite and only delivered to the site for the placing.

2.4.6 Removal of Topsoil

Topsoil was removed which mainly comprised vegetable black soil and discarded.

2.4.7 Roadbed Preparation

Excavations were done in sections of 20m in the roadsides from the existing road level to the level with the most suitable ground condition (known as roadbed) to build pavement layers. Excavations were done with the help of excavators.

Figure 8 Roadbed Preparation

2.4.8 Sublayers

Sublayers of material G-7 were then built on the roadbed using borrowed material, damped, spread and compacted to specification requirements in layers of 150mm. At completion of each layer the laboratory team tested for compaction before giving a go-ahead for another layer.

This was followed by layers of material quality G-15; which was also borrowed material, damped, spread and compacted in layers of 150mm.

Figure 9 Dumping of Borrow material (G15) during sublayer formation

Figure 10 A well compacted sublayer Section of the road

2.4.9 Pulverisation & the Sub-base formation (Stabilisation)

A pulveriser was used to rip the existing road pavement which was the mixed with G15 borrowed material, spread and compacted to form the sub-base of (G30).

2.4.10 Road Base (CRR)

A base layer of crushed rock was then laid and compacted to specifications with the help of heavy drum rollers, water bowser and grader for mixing and levelling. The gravel used was from the project quarry and was well-graded to the contract specifications.

Figure 11 Stockpile of Base Material

2.4.11 Bituminous layers

Prime coating of the base was done using MC-30 cut-back bitumen at a nominal spray rate of 1.0 l/m2 followed by Aggregate for blinding at a spread rate of 0.0035m3/m2.

Thereafter, Asphalt concrete surfacing (Hot mix, 60/70 PG bitumen, 50mm thickness). Bitumen for Asphalt Concrete Surfacing was 60/70 PG bitumen and then a Tack Coat of 30% stable grade bitumen emulsion

2.4.12 Ancillary roadworks

Works here included road marking for the finished surface, erection of road signs, erection of marker posts as well as erection of guardrails along some sections of the road.

CHAPTER THREE: PROJECT MANAGEMENT PRACTICES

Project management involves the planning, coordination, and control of construction projects from inception to completion. It encompasses a wide range of activities, including project planning and scheduling, cost management, resource allocation, risk management, and quality control. When project management is effective, it ensures that projects are completed on time, within the budget, and to the required quality standards.

This chapter shall detail the author's involvement in the project management activities on the Ishaka-Katunguru road project.

3.1 Project Planning

3.1.1 Scheduling

Project scheduling involves creating a timeline for the project, determining the order of activities, and estimating the duration of each activity. The critical path method (CPM) is a commonly used technique for project scheduling in construction. CPM helps in identifying the activities that have the highest impact on the project duration and enables project managers to allocate resources effectively (Larson & Gray, 2014).

For the Ishaka – Katunguru road project, Primavera P6 was used to generate the project schedule by the Planning Engineer at the Contractor's head office with the input of the Project Manager and the author. The original program of works was submitted to the Engineer on July 14, 2017 in accordance with the contract.

The author who also double as the Project Quantity Surveyor was tasked each month to give an update on the physical progress of work which would then be used to update the work program. The author generated cash flow forecasts and s-curves that formed part of the progress report that he presented at the monthly site meetings organised by the Engineer with the Client in attendance.

3.1.2 Project Delays

Project delays were realised on the project and these were attributed to various factors such as: delay by the client to issue final drawings, delay in mobilising the Engineer, delay in relocation of utilities by the nominated sub-Contractors among others.

The author of this report was tasked to log these delay events and put the Engineer to Notice via correspondence in accordance with the FIDIC contract. Subsequently these events were used by the author to develop claims with the initial claim determination resulting into a full-years' time extension.

Further compensable claims arose due to several disruptions by the client which earned the Contractor additional time extension.

3.2 Project Cost Management

Cost estimation is another crucial aspect of construction project management. Accurate cost estimation ensures that projects are financially viable and helps in securing funding. Various techniques, such as parametric estimating, analog estimating, and bottom-up estimating, can be used for cost estimation in construction projects (Hinze & Thurston, 2019).

3.2.1 Cost Control

Cost control refers to the process of monitoring and managing expenses associated with the project to ensure that they remain within the approved budget. It involves the implementation of strategies and techniques to minimize cost overruns, maximize cost efficiency, and maintain financial discipline throughout the project lifecycle.

According to the Chartered Institute of Building (CIOB), cost control is "the process of monitoring cost and performance throughout a project and taking action to ensure the project remains within budget and achieves its financial objectives" (CIOB, 2016).

Another source that provides a comprehensive definition of cost control is the Project Management Institute (PMI). According to PMI, cost control involves "monitoring the status of the project to update the project budget and managing changes to the cost baseline" (Project Management Institute, 2017). It further emphasizes the importance of collecting accurate data on costs, comparing actual costs to planned costs, identifying variances, and implementing corrective actions to control costs effectively.

For the Ishaka – Katunguru Road Project, cost control was vested to the author who worked in-concert with the Project Manager. The author was provided with a Microsoft Excel workbook file which had been used during the rate build up at the time of bidding. Additionally, the project administrator furnished the author with the Contractor’s monthly expenditures in relation to the project works.

The above tools helped the author to make analysis of what was budgeted, what was being spent versus what was to be claimed in the Contractor’s Interim Payment Certificates. This periodical analysis formed a great tool for cost management and control.

3.2.2 Advanced Payment and Advance Payment Guarantee

Advance payment is "an initial payment made by the Employer to the Contractor at the outset of the works. It is intended to provide the Contractor with working capital for the purchase of materials and mobilization of resources" (Ndekugri & Rycroft, 2013).

Advance Payment Guarantee is a type of financial security, often provided by a bank, which ensures that the Contractor will repay the advance payment received from the owner if the Contractor fails to perform its obligations under the contract" (Kelleher & Loulakis, 2019).

Having furnished the Client with an advance payment guarantee, the Contractor was paid an advance sum of 15% as stipulated in the contract to kick-start the project activities. This sum was recoverable as 10% of each amount due to the Contractor in the interim payment certificates that came after 25% value of works had been claimed.

3.2.3 Interim Payment Applications and Certificates

Interim Payment Applications or progress payment applications, are documents submitted by the Contractor to the Client or Employer to request payment for work completed and expenses incurred during a specific period.

Interim Payment Certificates refer to documents issued by the Engineer instructing the client to pay the Contractor, a specific sum of money for work completed up to a certain stage or period. These certificates serve as a means of facilitating regular payment and cash flow throughout the duration of the project.

The Contractor for each month submitted to the Engineer for his information and consideration a payment application of the amount due to him for the works executed in the period ending.

Basing on these submissions the Engineer would issue a payment certificate if works met the contractual condition of the value of works having to meet a threshold of 1.5% of the contractual sum in order to be considered.

3.2.4 Final payment certificate

Final payment certificate refers to a document issued by the client or employer to the Contractor at the end of a project, certifying the final amount due for the completed work. It represents the final settlement of all financial obligations between the parties involved in the construction contract.

3.2.5 Cost Claims

Cost claims refer to requests made by Contractors or SubContractors to the Client or Employer for additional payment due to unforeseen or changed circumstances that have resulted in increased costs on a project. These claims typically arise when the Contractor believes they are entitled to compensation for costs that were not initially accounted for in the contract.

For this particular project the Contractor made several cost claims for the Engineer's determinations; and the include:

Disruption costs when the Contractor was barred from constructing within the national park as per the approved schedule of works because the client had not sought Uganda Wildlife Authority Approval (UWA). This required a demobilisation and remobilisation to another section of the road.

The Contractor also made claim for extra works done in forward maintenance of the dilapidated road into a motor-able state. The Contractor's plea for consideration of this item as a provisional sum item was denied by the Engineer, a decision upheld by the dispute board.

The author was privileged to be part of the team that represented the Contractor during the dispute resolution and review meetings.

3.2.6 Variations

Project variations refer to changes or modifications made to the original scope of work, design, specifications, or any other contractual element of a construction project. These variations can be initiated by the Client, or Contractor, due to unforeseen circumstances during the course of the project.

On Ishaka – Katunguru Road Project, variations were initiated by both the Contractor and the Engineer. For example, the Contractor proposed a change of pavement design from Marshall to

Superpave which he believed to have better performance, a request which was denied due to budgetary implications and the rigidity of the government procurement system.

The Engineer on the other had instituted several variations during the project execution most especially with the drainage designs. The cost implications of these variations were quoted by the Contractor and submitted to the Engineer for his perusal and approval.

3.3 Resource Allocation

Resource allocation is a critical task in construction project management as it involves assigning the right resources to the right tasks at the right time. Resource allocation includes managing labor, equipment, materials, and subContractors. Effective resource allocation helps in optimizing project performance and minimizing delays (Abdullahi, 2021).

3.3.1 Human Resource

The project staff were categorised as follows

3.3.1.1 Engineer's Staff

- **Key staff**

These were the Consultants Key Personnel stipulated in the contract to act in different capacities such as Materials Engineer.

- **Support Staff**

These were personnel hired by the Contractor but were to serve the Engineer's team in different capacities such as chainmen, laboratory attendants etc.

- **Students**

The Client, (UNRA) forwarded students on internship program work under the Engineer so as to build capacity.

3.3.1.2 Contractor's Staff

The Contractors staff was broadly divided into office Project staff and Stone quarry staff. They each had own administration and cost centres.

- **Stone Quarry Staff**

The included an administrator, skilled labour like electricians and unskilled labour.

- **Project Staff**

The included were sub categorised into camp-based and field-based:

- Camp-based Staff

Administrator and his support staff which included front desk, human resource officers, chefs, clinic attendants, cleaning staff among others. Key project personnel which included: Project manager, quantity surveyor, materials Engineer, surveyor, Enviromentalist, Health and Safety team and Site Engineer. Other staff included: labarotoray attendants,

- Field-based Staff

These included masons, machine operators, drivers, flag personnel, foremen and unskilled labour. The field staff were subdivided into groups according to their work; and these included: Steelwork team, Carpentry team, Forward maintenance team, borrow site teams, Concrete team, Earthworks Team, Lab testing teams. Each team was headed by a superintendent, usually a foreman

3.3.2 Plant and Equipment Resource

Plant were allocated according to active work packages at hand. For example:

a) A forward maintenance team would have a truck, grader and a backhoe.
b) A concrete team would have a hoist truck and a mobile concrete mix truck
c) An earthworks team would have a grader, drum roller, several trucks, and an excavator

3.4 Risk Management

Risk management is an integral part of construction project management. Construction projects are inherently risky due to various factors such as unforeseen events, changes in scope, and weather conditions. A comprehensive risk management plan helps in identifying potential risks, assessing their impact, and implementing mitigation measures. Risk management techniques such as risk identification, risk analysis, risk response planning, and risk monitoring are essential for successful construction project management (Chapman & Ward, 2016).

Several risk management measures were put in place in anticipation of what could go wrong so as to be able to combat or reduce the impact of it on the project. Mitigation measures included but not limited to the following:

a) Taking out different insurance policies such as Contractor's all risk, motor comprehensive insurance, workers compensation among others
b) Setting-up a weather station and obtaining records from the regional meteorological station to study and predict the weather patterns of the project area.
c) Numerous health and safety measures

For this report focus is put of the Health and Safety Management.

The Contractor did a commendable job in regards to the health and safety of the workers as well as that of the public. The Contractor ensured the following:

a) Adequate signage on the road for motorists and passangers
b) Adequate protection of work zones from the public
c) Protection of natural resources within the project zone
d) Protection of the public from dust pollution on the road and at the quarry
e) Adequate notification of the public before any blasting works at the stone quarry
f) Protective gear for all workers in form of safety boots, helmets, reflective jackets, noise muffs, eye gaggles, hand gloves among others
g) Safety drills were conducted every morning for the field workers
h) An active ambulance was provided for emergency cases when they arose

i) A site clinic was established to handle minor cases

At the end of every month the health and safety team submitted their report to the author for inclusion in the general monthly progress report that he prepared for the site meetings.

Figure 12 Project Ambulance

Figure 13 Field Morning drill by the Health & Safety Team

Figure 14 Environmental Protection at the Quarry

3.5 Quality Control

Quality control is crucial in construction project management to ensure that projects meet the required quality standards. It involves monitoring and inspecting construction activities, conducting tests, and implementing quality assurance measures. Quality control helps in identifying and rectifying defects or deviations from specifications, ensuring that the final product meets the client's expectations (Olawale & Sun, 2010).

On Ishaka – Katunguru Road Project the Engineer played a superintendent role over the Contractor to ensure that the quality checks and tolerances as specified in the contract are met. “General Specifications for Roads and Bridge Works” by Ministry of works and Transport formed part of the contract.

3.5.1 Field Tests

Whereas the Contractor’s lab team checked the works for conformity to specifications, the Engineer’s lab team counter checked for verification. Both the Contractor and the Engineer had separate fully equipped laboratories at the campsite established for the sole purpose of quality control and checks. At all stages of work, the Contractor would submit test results to the Engineer for his review and approval.

3.5.2 Method Statements

It should also be noted that prior to any activity the contractor submitted to the Engineer a Method Statement of how he was to execute the works.

3.5.3 Quality Assurance

The Contractor was required to submit Test Results of material to be used on the project to the Engineer for his approval before stocking.

Thus on several occasions samples would be taken to Central Material Laboratory, Kireka and Makerere University Materials Laboratory for additional tests. These mainly included concrete culverts, steel bars, bitumen, crushed aggregate (CRR) among others

3.6 Project Communication Management

Project communication involves the exchange of information, instructions, and updates among stakeholders, including the client, contractors, subcontractors, architects, engineers, and other team members involved on a construction project. Effective communication is crucial for ensuring the successful execution of a project, coordinating activities, and managing expectations. It helps facilitate collaboration, resolve issues, and keep all parties informed about project progress and changes.

Formal letters were the most used channel of communication between the Contractor and the Engineer. This was followed by e-mails and site meetings.

Communication within the Contractor's key office staff was mainly by e-mail exchange for collaboration as well as face to face interaction.

Communication to field staff was mainly verbal and by phone-call. All superintendents were given phones with prepaid airtime for communication. The same was done for the Engineer's key staff.

CHAPTER FOUR: CHALLENGES AND LESSONS LEARNT

4.1 Challenges Faced and Solutions

4.1.1 Time Overrun

Project delays were realised on the project and these were attributed to various factors such as: delay by the client to issue final drawings, delay in mobilising the Engineer, delay in relocation of utilities by the nominated sub-Contractors among others.

The author submitted claims to this effect for time extension which were determined and granted and saw the project duration extended for over two years.

4.1.2 Cost Overrun

The project faced some financial and administrative challenges as some items like road maintenance had been underquoted by the bidder. The Contractor's plea for consideration of this item as a provisional sum item was denied by the Engineer, a decision upheld by the dispute board.

4.1.3 Procedural Disputes

There were many contentious issues over contractual interpretation on roles and procedure. These were forward to the Dispute board whose opinions were adopted by the parties.

4.2 Lessons Learnt

Good knowledge of the contract is very key in efficient running and delivery of the project. A small omission can be detrimental for either the Contractor or the Client

Project cost control is equally crucial for the smooth running of the project as well as its profitability in the long run. When costs are not well planned and controlled a cost over-run may result or even leave the Contractor heavily indebted.

Risk management is very important if success is to be realised unhindered. Health and safety should never be overlooked during project implementation

Efficient site organisation and management practices make oversight and project control very easy to stir the project in the desired direction

Communication on a project among stakeholders is paramount to ensure a smooth flow of the project. Communication should be clear, on time and comprehensible by the intended receiver.

Efficient Stock management is often not given the importance it disserves and yet it is important to the project cash flow.

Quality control allows checks and saves the Contractor from costs of rework and also the risk of a damaged reputation in the near future.

A realistic program of works and resource allocation is key if a project is to be delivered within the stipulated time.

4.3 Conclusion

In conclusion, project management provides a structured approach to achieve project goals and objectives while balancing constraints such as time, cost, quality, scope, and resources. It involves a comprehensive understanding of project requirements, effective communication and collaboration among stakeholders, risk management, and the ability to adapt to changes and challenges that may arise during the project lifecycle.

A key aspect of project management is the ability to lead and motivate teams, ensuring that they work together towards a common goal. Project managers serve as the linchpin of the project, coordinating and integrating various tasks and activities to ensure successful project completion.

By applying proven project management methodologies and best practices, organizations can improve project success rates, optimize resource allocation, minimize risks, and deliver projects within budget and schedule. Effective project management not only enhances project outcomes but also contributes to overall organizational success and customer satisfaction.

REFERENCES:

Abdullahi, M. (2021). Resource Allocation and Optimization for Construction Project Management. International Journal of Scientific & Engineering Research, 12(1), 95-101.

Chapman, C., & Ward, S. (2016). Project risk management: Processes, techniques and insights (3rd ed.). Wiley.

Hinze, J. W., & Thurston, D. L. (2019). Construction management fundamentals. Routledge.

Larson, E. W., & Gray, C. F. (2014). Project management: The managerial process (6th ed.). McGraw-Hill Education.

Olawale, Y. A., & Sun, M. (2010). Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice. Construction Management and Economics, 28(5), 509-526.

Chartered Institute of Building (CIOB). (2016). Code of Practice for Project Management for Construction and Development. Wiley.

Project Management Institute (PMI). (2017). A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition. Project Management Institute.

APPENDIX

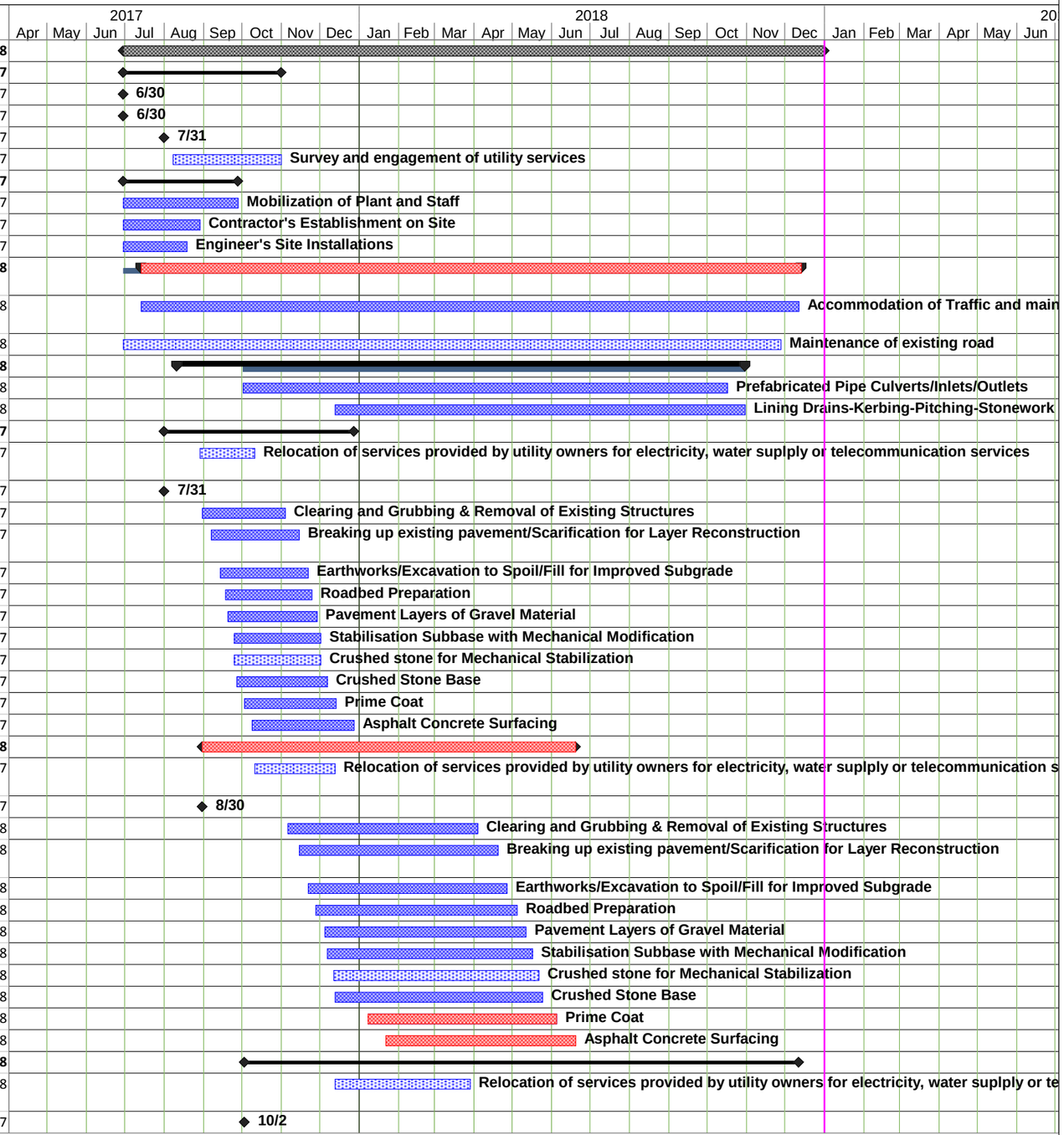
Sample Project Documents

PROGRAMME OF WORKS

MOTA-ENGIL AFRICA

PROGRAMME OF WORKS

ID	Task Name	Qtys	Output/Day	Duration	Start	Finish
1	**Rehabilitation of Ishaka-Katunguru Road (58 km)**		0	**364 days**	**Fri 6/30/17**	**Mon 12/31/18**
2	**Preliminaries**		0	**87 days**	**Fri 6/30/17**	**Tue 10/31/17**
3	Commencement of Works		0	0 days	Fri 6/30/17	Fri 6/30/17
4	Site Handover		0	0 days	Fri 6/30/17	Fri 6/30/17
5	Final Design from UNRA		0	0 days	Mon 7/31/17	Mon 7/31/17
6	Survey and engagement of utility services		0	60 days	Tue 8/8/17	Tue 10/31/17
7	**Mobilization of Installations and Plant**		0	**63 days**	**Fri 6/30/17**	**Wed 9/27/17**
8	Mobilization of Plant and Staff		0	64 days	Fri 6/30/17	Wed 9/27/17
9	Contractor's Establishment on Site		0	42 days	Fri 6/30/17	Mon 8/28/17
10	Engineer's Site Installations		0	36 days	Fri 6/30/17	Fri 8/18/17
11	**Accommodation of Traffic and Maintenance of existing road km58+000/km0+000**		0	**347 days**	**Fri 7/14/17**	**Thu 12/13/18**
12	Accommodation of Traffic and maintaining Diversions and Detours	58 km	0	345 days	Fri 7/14/17	Tue 12/11/18
13	Maintenance of existing road	58 km	0	345 days	Fri 6/30/17	Tue 11/27/18
14	**Drainage km00+000/km58+000**		0	**295 days**	**Fri 8/11/17**	**Tue 10/30/18**
15	Prefabricated Pipe Culverts/Inlets/Outlets	2556 m	5	250 days	Mon 10/2/17	Tue 10/16/18
16	Lining Drains-Kerbing-Pitching-Stonework	20000 m2	48	208 days	Wed 12/13/17	Tue 10/30/18
17	**Roadworks from km 00+000 to km 11+000**		0	**100 days**	**Mon 7/31/17**	**Wed 12/27/17**
18	Relocation of services provided by utility owners for electricity, water suplply or telecommunication services		0	30 days	Tue 8/29/17	Tue 10/10/17
19	Access to the site from km00+000 to km11+000		0	0 days	Mon 7/31/17	Mon 7/31/17
20	Clearing and Grubbing & Removal of Existing Structures	55000 m2	0	46 days	Thu 8/31/17	Fri 11/3/17
21	Breaking up existing pavement/Scarification for Layer Reconstruction	16120 m3	329	49 days	Thu 9/7/17	Tue 11/14/17
22	Earthworks/Excavation to Spoil/Fill for Improved Subgrade	14224 m3	290	49 days	Thu 9/14/17	Tue 11/21/17
23	Roadbed Preparation	948 m3	19	50 days	Mon 9/18/17	Fri 11/24/17
24	Pavement Layers of Gravel Material	4471 m3	89	50 days	Wed 9/20/17	Tue 11/28/17
25	Stabilisation Subbase with Mechanical Modification	27830 m3	557	50 days	Mon 9/25/17	Fri 12/1/17
26	Crushed stone for Mechanical Stabilization	13915 m3	278	50 days	Mon 9/25/17	Fri 12/1/17
27	Crushed Stone Base	27595 m3	541	51 days	Wed 9/27/17	Wed 12/6/17
28	Prime Coat	131890 ltr	2536	52 days	Tue 10/3/17	Wed 12/13/17
29	Asphalt Concrete Surfacing	6413 m3	123	52 days	Mon 10/9/17	Wed 12/27/17
30	**Roadworks from km 11+000 to km 32+000**		0	**188 days**	**Wed 8/30/17**	**Tue 6/19/18**
31	Relocation of services provided by utility owners for electricity, water suplply or telecommunication services		0	45 days	Wed 10/11/17	Tue 12/12/17
32	Access to the site from km11+000 to km32+000		0	0 days	Wed 8/30/17	Wed 8/30/17
33	Clearing and Grubbing & Removal of Existing Structures	105000 m2	0	89 days	Mon 11/6/17	Tue 4/3/18
34	Breaking up existing pavement/Scarification for Layer Reconstruction	30776 m3	327	94 days	Wed 11/15/17	Thu 4/19/18
35	Earthworks/Excavation to Spoil/Fill for Improved Subgrade	27155 m3	289	94 days	Wed 11/22/17	Thu 4/26/18
36	Roadbed Preparation	1810 m3	19	95 days	Tue 11/28/17	Fri 5/4/18
37	Pavement Layers of Gravel Material	9052 m3	95	95 days	Tue 12/5/17	Fri 5/11/18
38	Stabilisation Subbase with Mechanical Modification	53130 m3	553	96 days	Thu 12/7/17	Wed 5/16/18
39	Crushed stone for Mechanical Stabilization	26565 m3	277	96 days	Tue 12/12/17	Mon 5/21/18
40	Crushed Stone Base	52681 m3	538	98 days	Wed 12/13/17	Thu 5/24/18
41	Prime Coat	251790 ltr	2518	100 days	Mon 1/8/18	Mon 6/4/18
42	Asphalt Concrete Surfacing	12243 m3	122	100 days	Mon 1/22/18	Tue 6/19/18
43	**Roadworks from km 32+000 to km 58+000**		0	**289 days**	**Mon 10/2/17**	**Tue 12/11/18**
44	Relocation of services provided by utility owners for electricity, water suplply or telecommunication services		0	60 days	Wed 12/13/17	Wed 3/28/18
45	Access to the site from km32+000 to km58+000		0	0 days	Mon 10/2/17	Mon 10/2/17

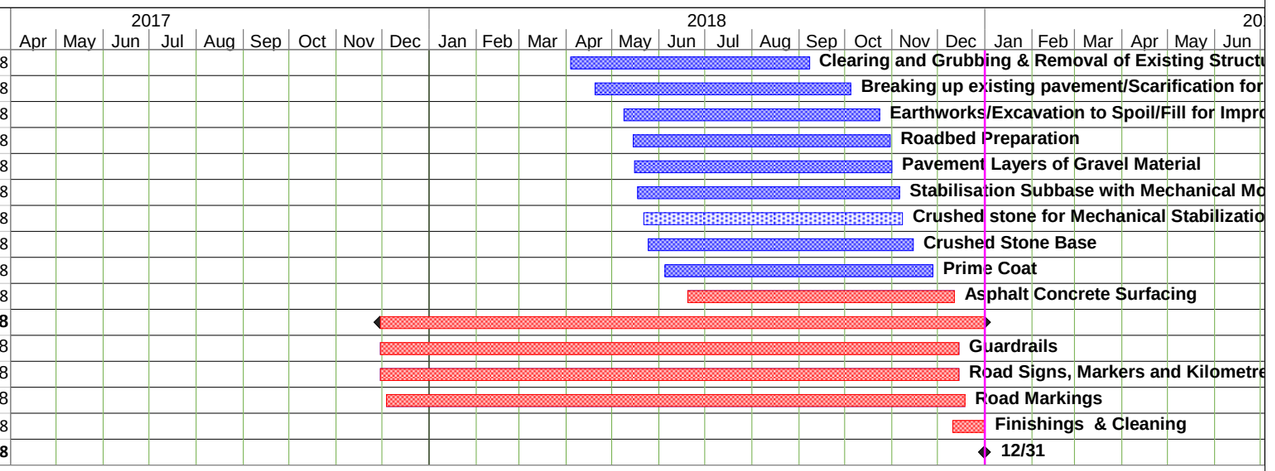


Task | Milestone | Summary | Project Summary | Progress | Critical

MOTA-ENGIL AFRICA

PROGRAMME OF WORKS

ID	Task Name	Qtys	Output/Day	Duration	Start	Finish
46	Clearing and Grubbing & Removal of Existing Structures	130000 m2	0	110 days	Wed 4/4/18	Fri 9/7/18
47	Breaking up existing pavement/Scarification for Layer Reconstruction	38103 m3	326	117 days	Fri 4/20/18	Thu 10/4/18
48	Earthworks/Excavation to Spoil/Fill for Improved Subgrade	33620 m3	287	117 days	Wed 5/9/18	Tue 10/23/18
49	Roadbed Preparation	2241 m3	19	118 days	Tue 5/15/18	Tue 10/30/18
50	Pavement Layers of Gravel Material	11207 m3	95	118 days	Wed 5/16/18	Wed 10/31/18
51	Stabilisation Subbase with Mechanical Modification	65780 m3	553	119 days	Fri 5/18/18	Mon 11/5/18
52	Crushed stone for Mechanical Stabilization	32890 m3	276	119 days	Tue 5/22/18	Wed 11/7/18
53	Crushed Stone Base	65224 m3	539	121 days	Fri 5/25/18	Wed 11/14/18
54	Prime Coat	311740 ltr	2534	123 days	Tue 6/5/18	Tue 11/27/18
55	Asphalt Concrete Surfacing	15158 m3	123	123 days	Wed 6/20/18	Tue 12/11/18
56	**Ancillary Roadworks**		**0**	**256 days**	**Thu 11/30/17**	**Mon 12/31/18**
57	Guardrails	9011 m	33	250 days	Thu 11/30/17	Fri 12/14/18
58	Road Signs, Markers and Kilometre Posts	57 un	0	250 days	Thu 11/30/17	Fri 12/14/18
59	Road Markings	58 km	0	250 days	Mon 12/4/17	Tue 12/18/18
60	Finishings & Cleaning		0	10 days	Tue 12/11/18	Mon 12/31/18
61	**Provisional acceptance**		0	**0 days**	**Mon 12/31/18**	**Mon 12/31/18**



Task | Milestone | Summary | Project Summary | Progress | Critical

RFI SAMPLE

CIVIL WORKS FOR REHABILITATION OF ISHAKA – KATUNGURU ROAD (58KM)
PROCUREMENT REFERENCE NO: UNRA/WORKS/2015-16/000058

Uganda National Roads Authority (UNRA)	MOTA-ENGIL AFRICA UGANDA	MBW CONSULTING

REQUEST FOR INSPECTION	**RFI No.**

We Request Your Attendance for: ☐ Inspection ☐ Survey ☐ Test ☐ Measurement

1. Type of Work: ☐ Roads ☐ Structures ☐ Others:

2.Inspect/Survey/Test/Measure Schedule for: Date: - Time: -

3. Location:

4. Inspection: ☐ First ☐ Second ☐ Third

5. Purpose of the Inspection:

BoQ No.: Attachment : ☐ Test Result ☐ Survey Sheet ☐ Drawings ☐ Others

Submitted by for Contractor:

Name: Date: Time: Sign:

Received by for Engineer:

Name: Date: Time: Sign:

6. Inspection /Survey / Test/Measure Report by Engineers Staff		**Signature & Date**
☐ Inspector of Works		
☐ Surveyor		
☐ Materials Engineer		

RE/DRE:

……

……

……

The Works are: ☐ Approved ☐ Approved as Noted ☐ Rejected ☐ Surveyed ☐ Measured ☐ Not done

Signature: …… Date: ……

Finally Received by Contractor Name: _____ Signature: _____Date/Time: _____

TRAFFIC MANAGEMENT PLAN

MOTA-ENGIL
AFRICA

ISHAKHA - KATUNGURU
ROAD

Project:
Civil Works for the Rehabilitation of Ishakha - Katunguru Road (58km)

JUSTIFICATION MEMORY

Temporary Alternated Traffic Scheme

Document Control

Ed	Date	Prepared by	Reviewed and approved By	Description	Status
0	05-07-2017	Alexandra Dançante	Paulo Salgado	1st draft (to become Ed 0)	For the Engineer comments

1. INTRODUCTION

This memory serves to describe and justify the Temporary Signage Plan to implement the work, **Civil Works for the Rehabilitation of Ishakha - Katunguru Road (58km)** , at temporary Alternated Traffic Scheme taking into account the reduction of risks in pathways affected during execution of the work provided for allowing the circulation traffic and ensuring the safety of pedestrians, residents, workers and equipment.

The temporary signs to be placed are in accordance with the Traffic Signs Manual (Volume1), from UNRA.

2. DESCRIPTION OF WORK AND SIGNALING TO USING

Residents and road users concerned will be informed of the existence of works through pamphlets.

Will be guaranteed access to residents and traffic circulation as follows:

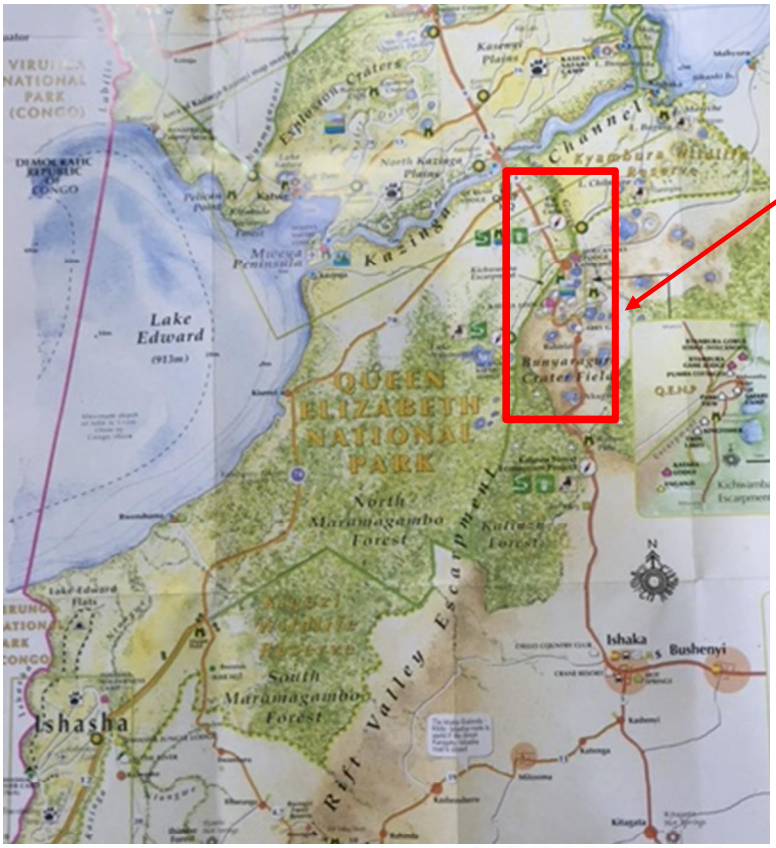
As per Program of Works during the 18 months we will conduct intervention between CH 0+000 (Katunguru) and 58+000 (Ishaka) .

The works executed in half width of the carriageway, the circulation of traffic shall proceed in the other half width. Adequate traffic signs and cones shall be installed.

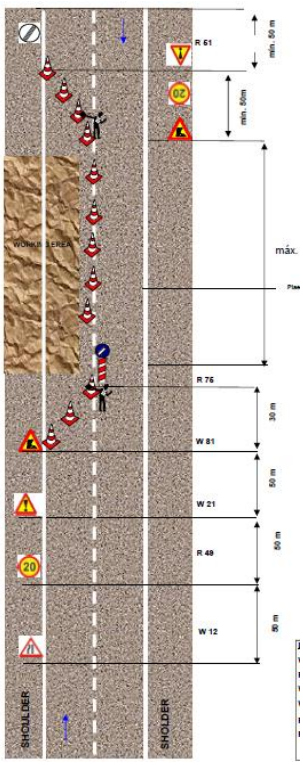
Supervisors and flagmens shall be appointed to control the traffic flow and ensure safe circulation conditions.

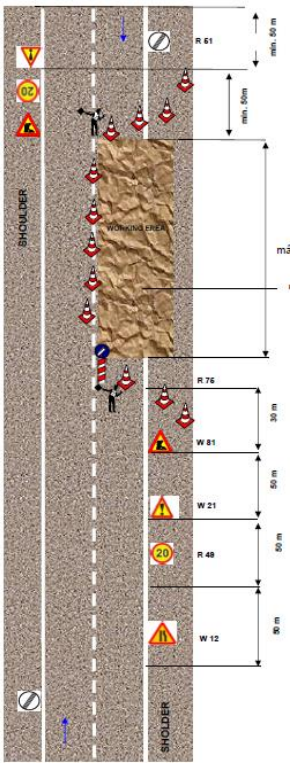
16 km of the project are inserted in the Nacional Park Queen Elizabeth, being a sensitive and protected zone, we will take special safety and environmental measures:

- Reduction of the speed limit to 20KpH
- Control the traffic with flagmens
- Positioning of traffic signs to inform the drivers
- Waste management
- Training for workers about waste control and the behavior in case of approach of animals.
- Arrange rangers security (Nacional Park Queen Elizabeth)



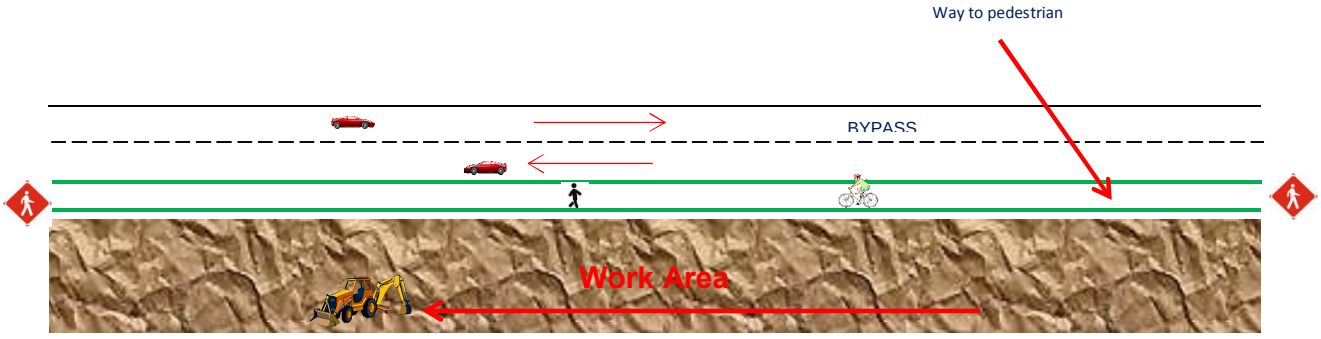
Location of the work area in site the Nacional Park Queen Elizabeth





APPROVED: *Paulo Salgado(Signature on original)*

During the execution of work will be maintained and marked the way for pedestrians.



This layout applies at intersections where there is higher number of pedestrians and residents.

3. POSITION AND LOCATION OF ROAD SIGNS

The signals are to be applied as per drawings attached, and namely are:

_ Roadworks (W81);

_ Speed limit (R49);

_ Road Narrows one side (w12);

_ Other danger (W21);

_ Pass left (R75).

Signs of existing locality are to be maintained, used, and adapted to the requirement of each phase.

The sequence signals kits will be spaced from each other by 50 m, approximately, and when possible.

In situations where this is not possible that distance will be shorten in proportionality to the length of the track and adjusted for a good road view position.

4. SPECIFIC REQUIREMENTS

Speed Limits

The speed limit will be reduced to 20kph work area, according to the Contract Special Conditions and General Conditions of Contract (section 1503rd - Accommodation traffic, temporary traffic control schools) . The speed limit can be reduced to 20kph temporarily during track closing and narrowing road, 2 flagmen's. All gear changes and reductions shall be in accordance with approved licenses Occupation Road and Restrictions speed zone issues by UNRA.

5. INCIDENTS MANAGEMENT

Details are described in Project Traffic Management Plan.

6. ATTACHMENTS

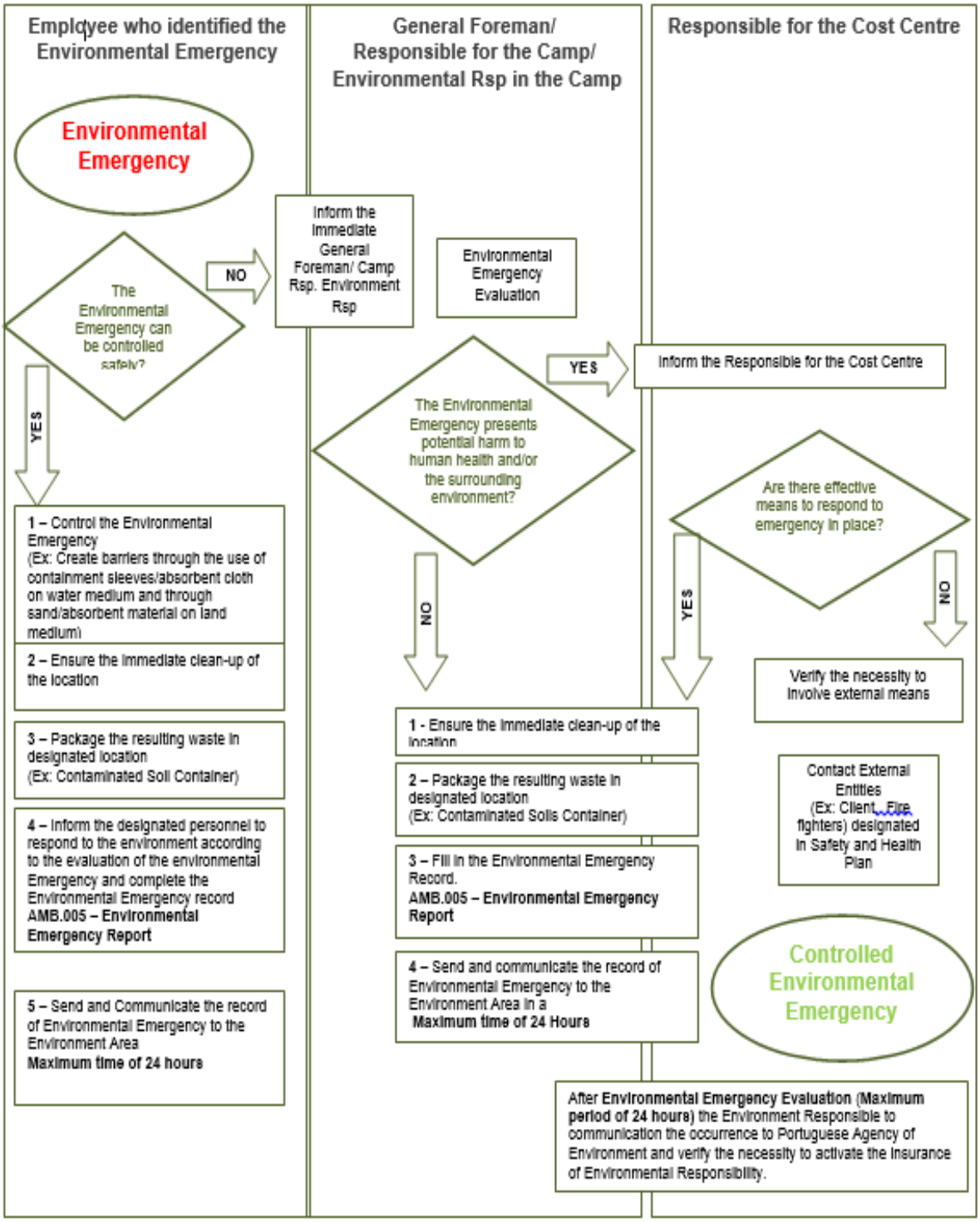
Drawings number's:

_ ISK/TD/001 – Temporary works on shoulder scheme

_ ISK/TD/002 – Temporary works on shoulder scheme

ENVIRONMENT MANAGEMENT PLAN

PERFORMANCE SHEDULE



APPROVED: *Mauro Ventura (Signature on original)*