

APPENDICES

Appendix 1-1: Other residential status of the respondents

Other residential status of the respondents	Missing Link					
	No. 3		No. 6		No. 7	
	Number	Percentage	Number	Percentage	Number	Percentage
Residing in work place/ not specified but renting a house outside the project are/ given a house/ staying with a relative	8	10.7	2	9.5	1	0.5
Owning a house in Kibera					1	0.5
Renting a house in Kibera	10	13.3	2	9.5	51	27.4
Owning a house in Kawangware					2	1.1
Renting a house in Kawangware	3	4.0	4	19.0	28	15.1
Owning a house in Satellite						
Renting a house in Satellite					10	5.4
Renting a house in Kiandaa					1	0.5
Renting a house in Race course					2	1.1
Renting a house in Huruma	4	5.3			3	1.6
Renting a house in Mbotela					1	0.5
Renting a house in Embakasi					1	0.5
Renting a house in Kariobangi	2	2.7			1	0.5
Renting a house in Waithaka					2	1.1
Renting a house Githurai					1	0.5
Renting a house in Kikuyu					1	0.5
Renting a house in Lower Kabete					1	0.5
Renting a house in Ngong Road					1	0.5
Renting a house in Mathare	3	4.0			1	0.5
Renting a house in Ruaraka					1	0.5
Renting a house in Umoja					1	0.5
Renting a house in Pumuwani					1	0.5
Renting a house in Langata	1	1.3				
Renting a house Mlango Kubwa	1	1.3				
Renting a house in Pangani	2	2.7			1	0.5
Renting a house in Dagorreti Corner			1	4.8	5	2.7
Renting a house in Kithini			1	4.8		
Renting a house in Kasarani			1	4.8		

Renting a house in Uthiru	8	10.7				
Renting a house in Buruburu	1	1.3				
Renting a house in Kangemi	18	24.0				
Renting a house in Kinoo	1	1.3				
Owning a house in Muguga Location	1	1.3				
Renting a house in Ngara	1	1.3				
Renting a house in Dandora	2	2.7				
Renting a house in Westlands	3	4.0				
Renting a house in Kamra	1	1.3				
Renting a house in Warugh	1	1.3				
Renting a house in Kayole	2	2.7				
Renting a house in Shauri Moyo	2	2.7				
Total	75		11	52.4	118	63.4

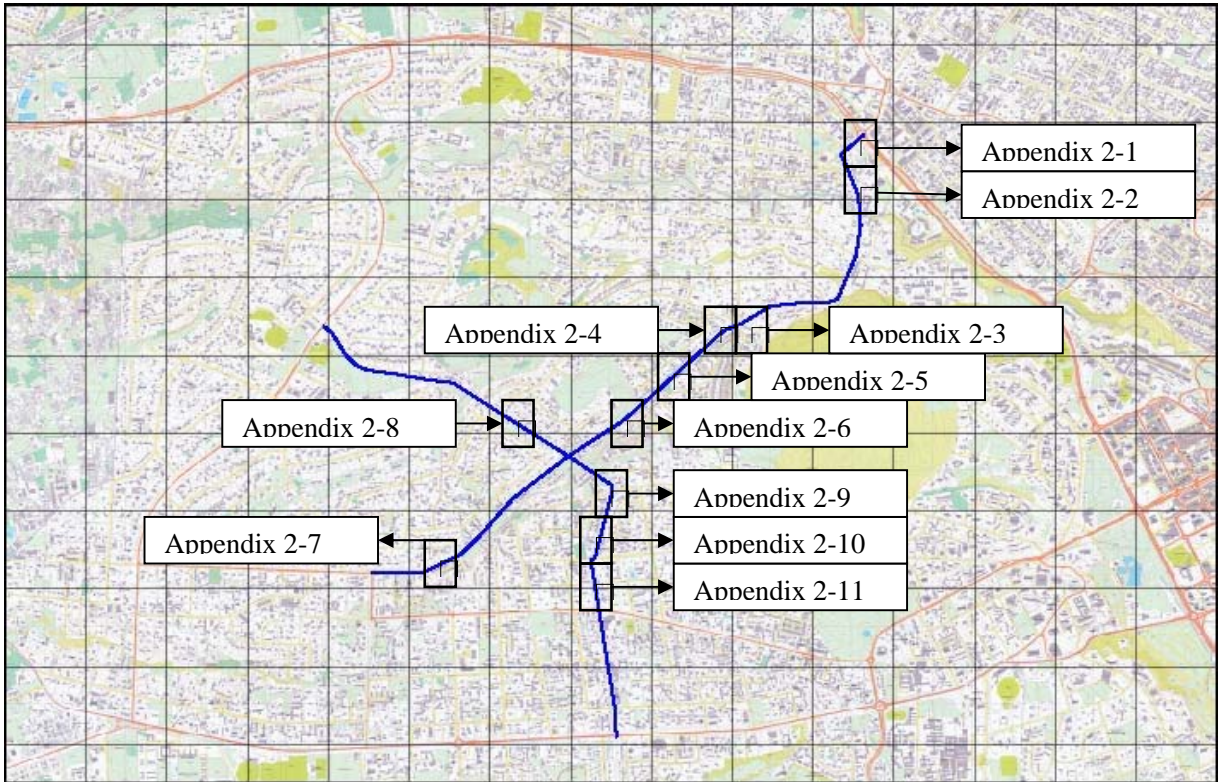
Appendix 1-2: Other Occupations of the Respondents

Other Occupation	Missing Link					
	No. 3		No. 6		No. 7	
	Number	Percentage	Number	Percentage	Number	Percentage
Farming/gardening	3	4	2	9.5	2	1.1
Carpentry	1	1.3	4	19	1	0.5
Hotel work	3	4				
Tailoring/Cushioning	2	2.7				
Shoe-mending/shoe shining	1	1.3				
Pastoring/preaching	1	1.3				
Street vending/hawking	13	17.3	5	23.8	25	13.4
Construction work	2	2.7			2	1.1
Mechanics	32	42.7			92	49.5
Salesmanship					1	0.5
Laundry					1	0.5
Hair dressing/Saloon					1	0.5
Landlady/Landlord					1	0.5
Total	58	77.3	11	52.3	126	67.6

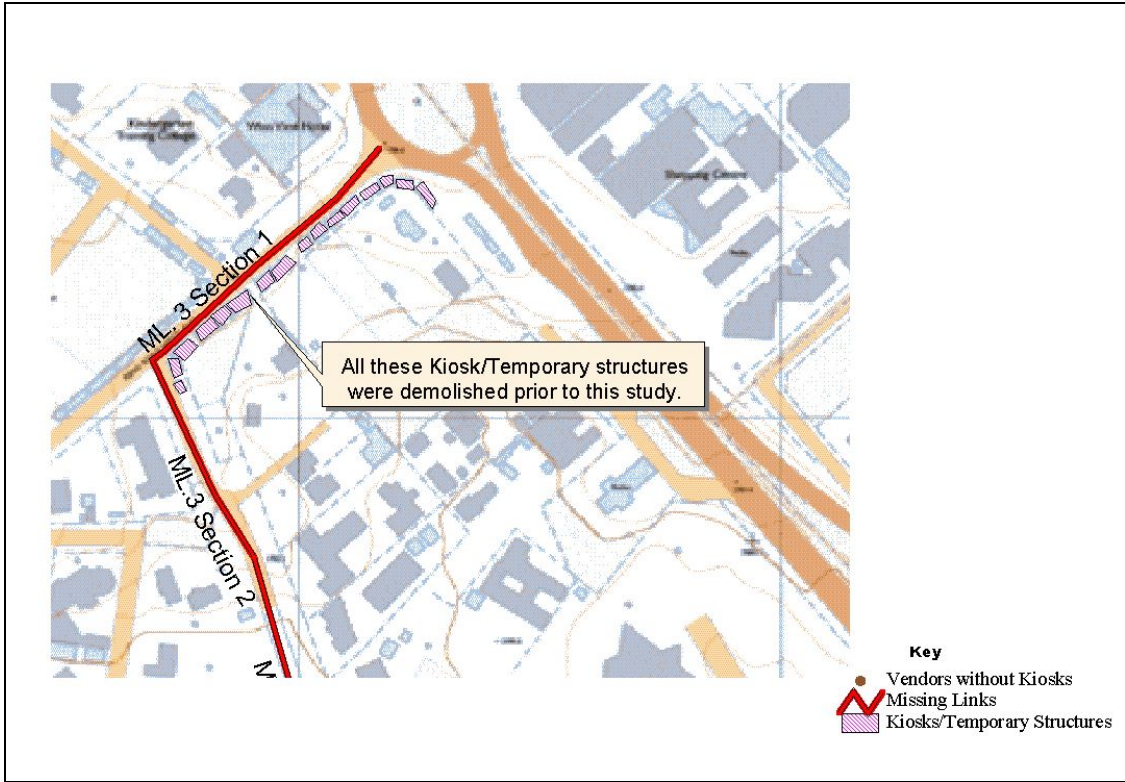
Appendix 1-3: Other requests by the respondents in the event of resettlement

	Missing Link					
	No. 3		No. 6		No. 7	
	Number	Percentage	Number	Percentage	Number	Percentage
Promote Business					3	1.6
Assist in purchasing tools/machines	4	4.3			8	4.4
Construct a new premise	5	6.7			10	5.4
Financial support/soft loan	12	16	3	14.3	42	22.7
Give notice before doing resettlement	3	4			2	1.1
Resettle in place with electricity/power and water					2	1.1

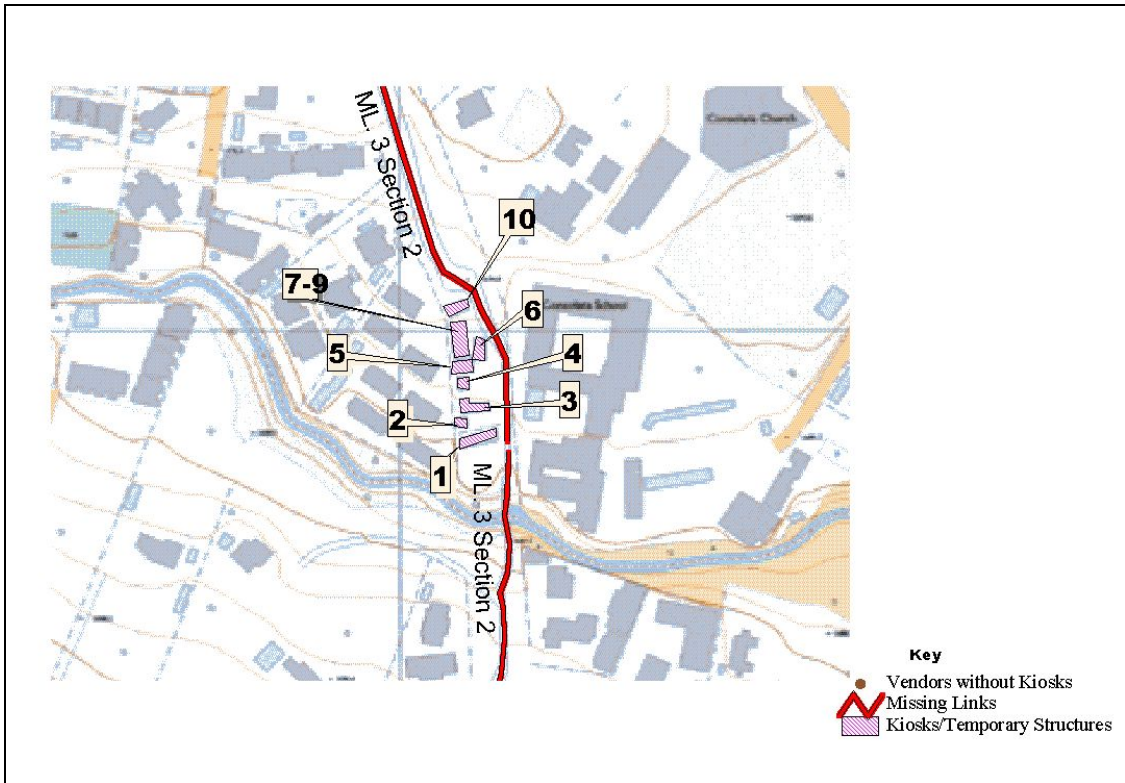
To be resettled in a permanent place					8	4.4
Construct a road which allows the informal businesses to operate on the sides					2	1.1
Provide licence/permanent permit	1	1.3	1	4.8	2	1.1
Educate the Children			1	4.8	4	2.2
Resettle in a Convenient place					1	0.5
Resettle in a place with electricity					3	1.6
Resettle in a place which is secure and not hidden					1	0.5
Resettle in a place with power/electricity, water and good road					1	0.5
Get a job/offer employment	4	5.3	1	4.8	5	2.7
Provide residential place					1	0.5
Capital to start business					1	0.5
Resettle in a place with electricity/power, water and shade					2	1.1
Resettle in a place which is accessible to customers	1	1.3			1	0.5
Resettle in a place with electricity and secure					1	0.5
Give contracts to repair government vehicles					1	0.5
Resettle in a place which is secure					1	0.5
Stop City council Harassment					1	0.5
Resettle in a place with people and secure					1	0.5
Resettle in a place with electricity, water, security and good shade					1	0.5
To be resettled in a place with water					2	1.1
Eviction not to be done					1	0.5
Provide Transport of goods/items to the resettlement /new site	1	1.3			1	0.5
The customers to be informed of the resettlement exercise	1	1.3				
Total	32	41.5	6	23.9	109	58.6



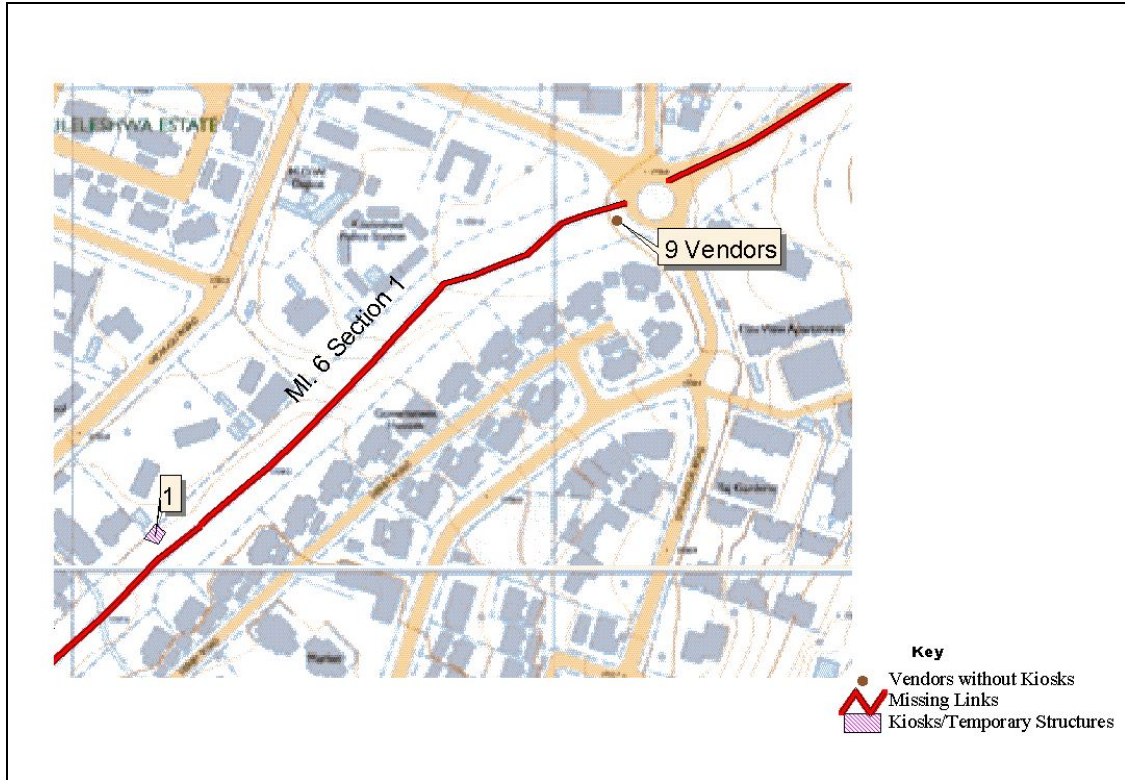
Appendix 2-0: Location of the Missing Links, Nos. 3, 6 and 7



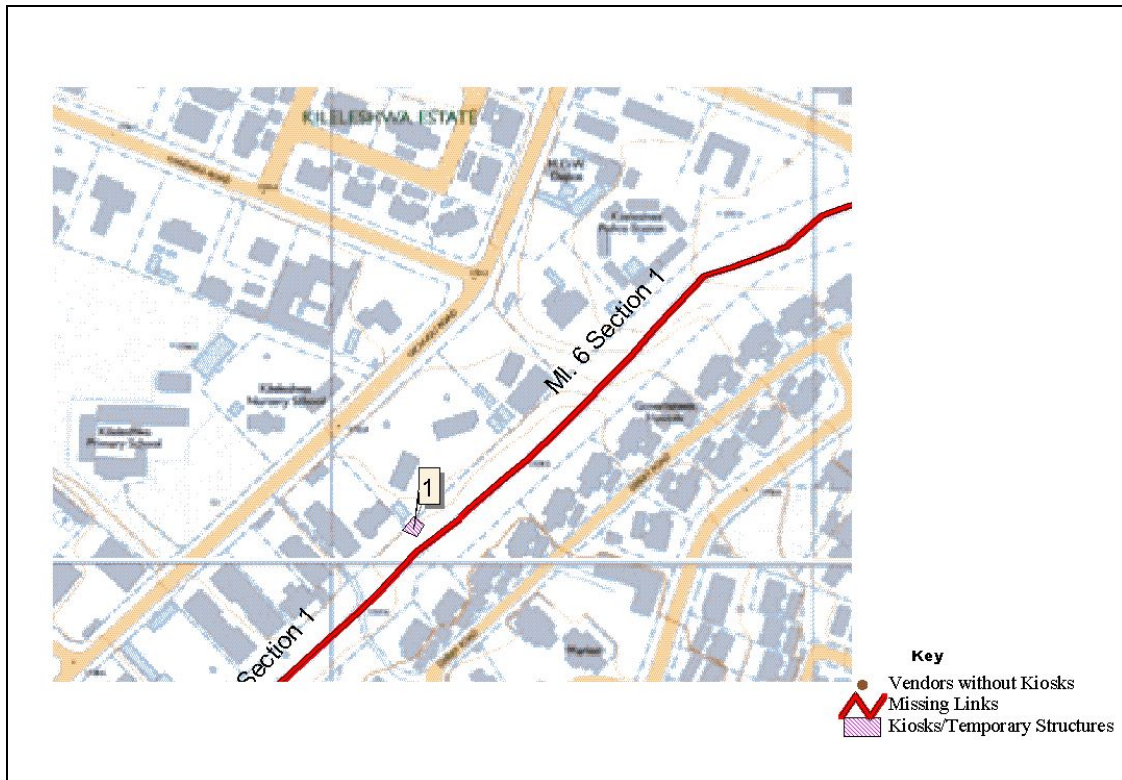
Appendix 2-1: Location of Kiosks/Temporary Structures on Missing Link No.3 Section 1



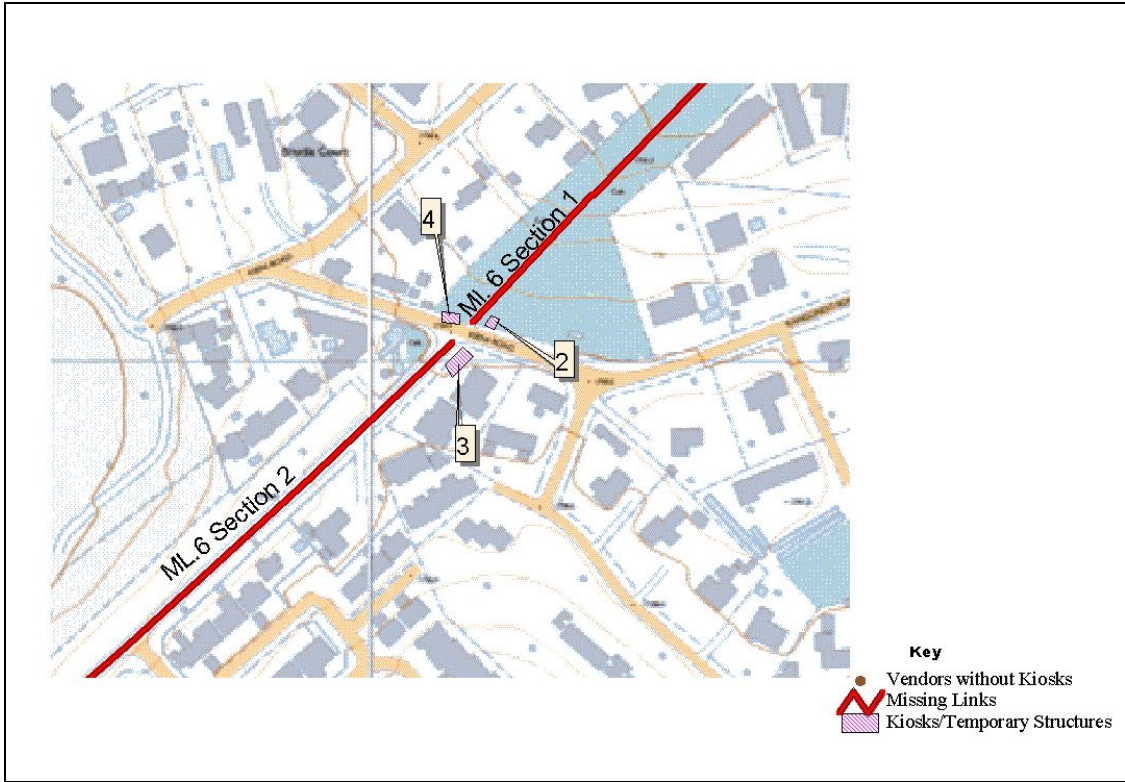
Appendix 2-2: Location of Kiosks/Temporary Structures on Missing Link No.3 Section 2



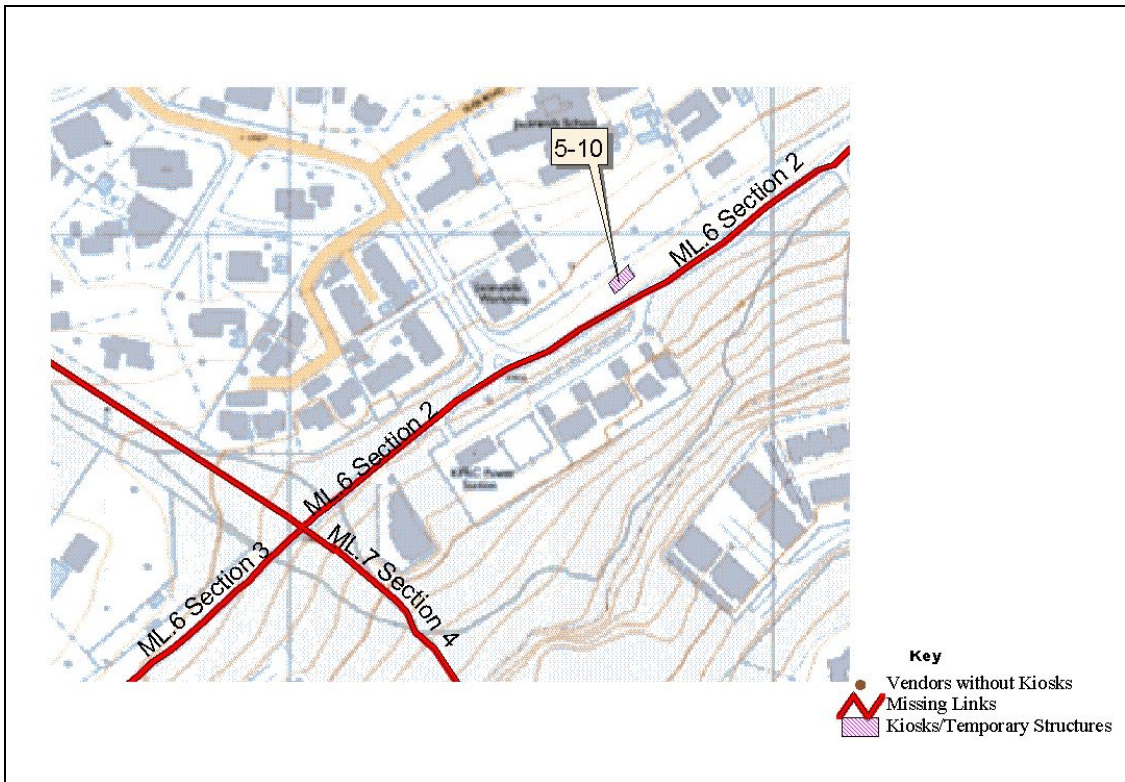
Appendix 2- 3: Location of Kiosks/Temporary Structures on Missing Link No.6 Section 1



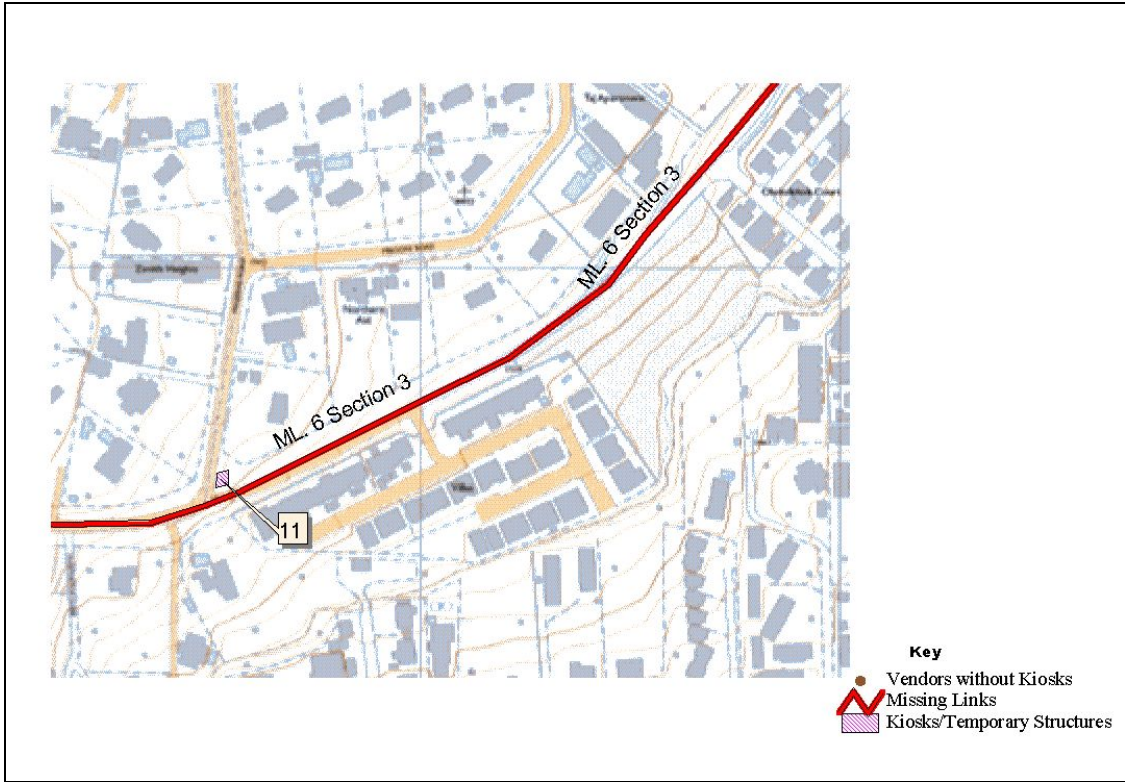
Appendix 2-4: Location of Kiosks/Temporary Structures on Missing Link No.6 Section 2



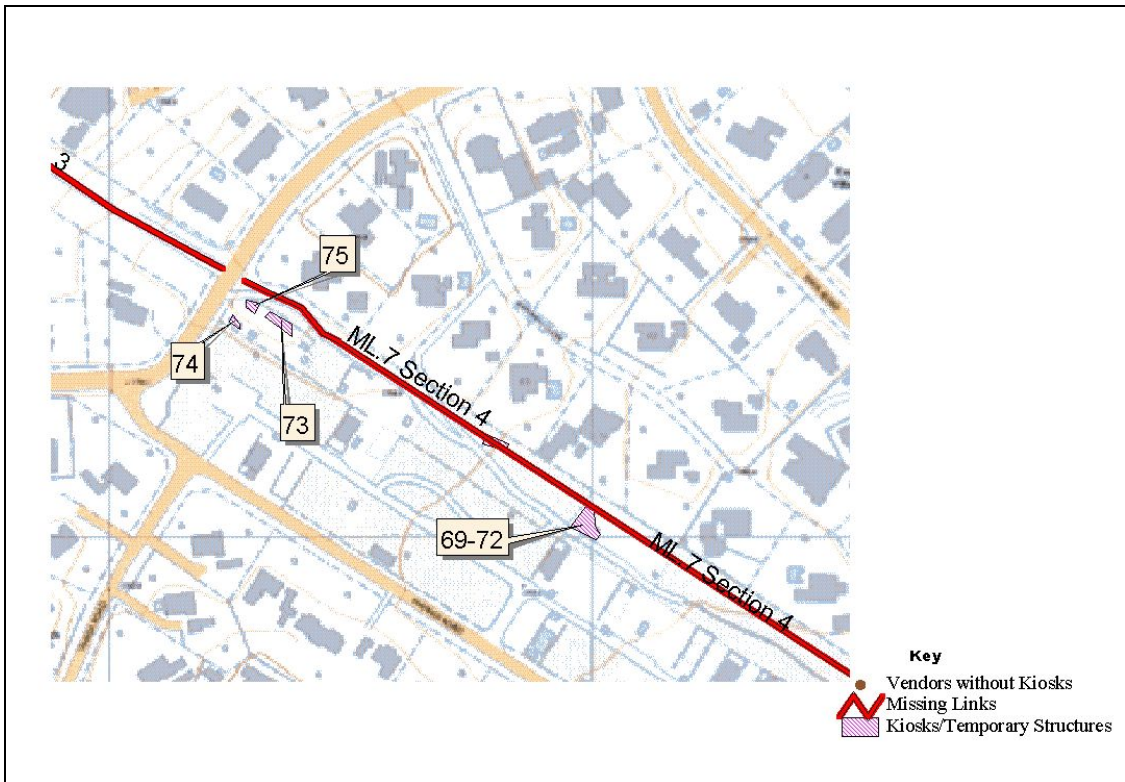
Appendix 2-5: Location of Kiosks/Temporary Structures on Missing Link No.6 Section 2



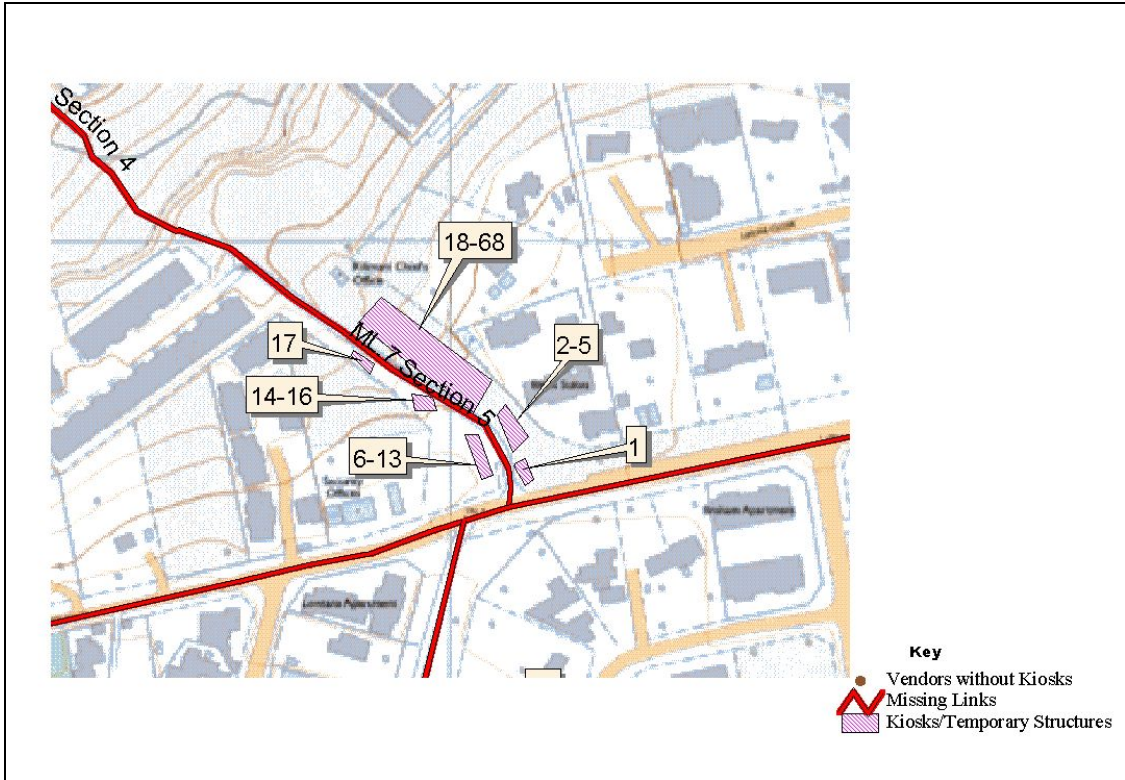
Appendix 2-6: Location of Kiosks/Temporary Structures on Missing Link No.7 Section 6



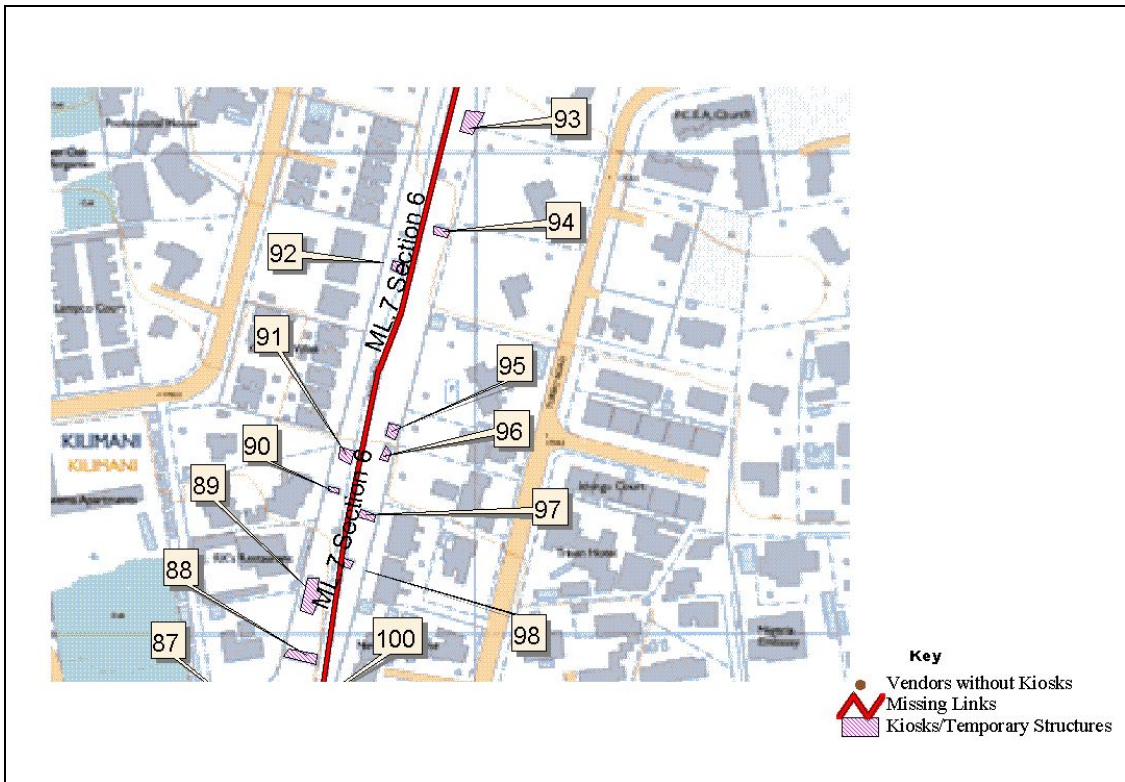
Appendix 2-7: Location of Kiosks/Temporary Structures on Missing Link No.7 Section 7



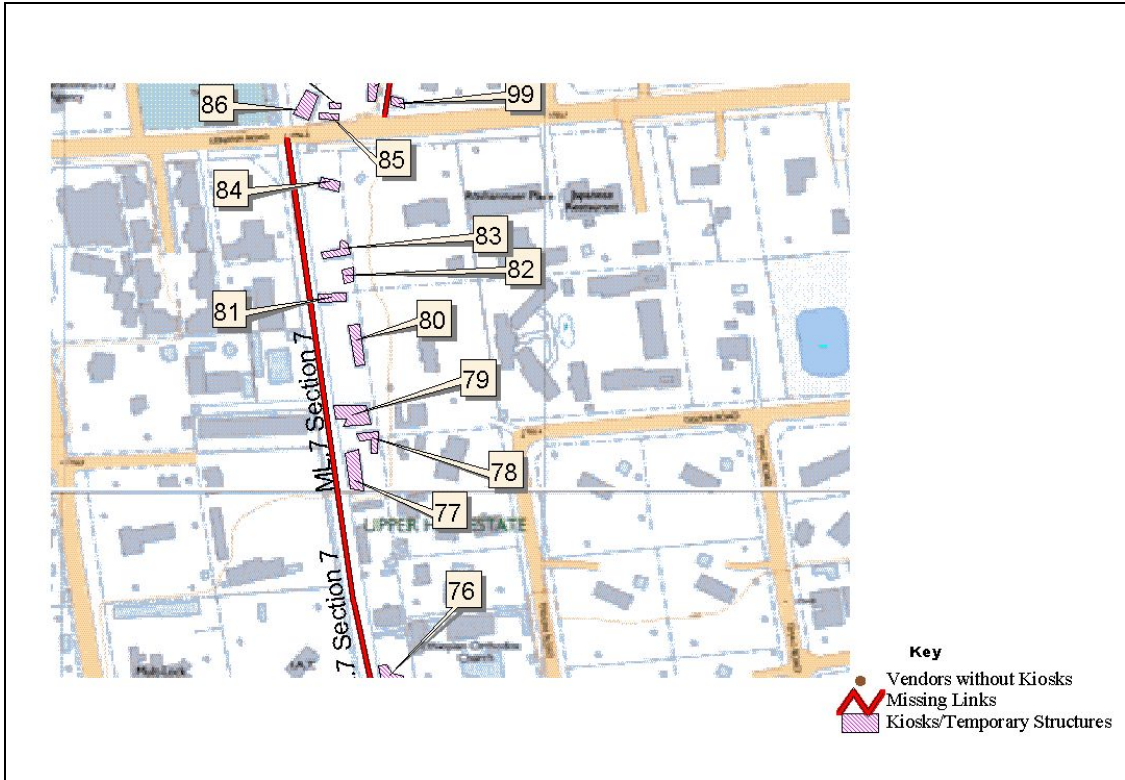
Appendix 2- 8: Location of Kiosks/Temporary Structures on Missing Link No.7 Section 5



Appendix 2-9: Location of Kiosks/Temporary Structures on Missing Link No.7 Section 4



Appendix 2-10: Location of Kiosks/Temporary Structures on Missing Link No.7 Section 4



Appendix 2-11: Location of Kiosks/Temporary Structures on Missing Link No.7 Section 4

Appendix 3: Estimated Costs of Kiosks/Garages of the Missing Links 3, 6 and 7

Category of the Structure	Materials	Source of Information		
		Chairman Denis Prits Squatter Village	Chairman Jua Kali Garages Ring Road Kilimani	Professional Carpenter-Ring Road Kilomani
16 M ² (4*4)	Timber 3*2	2,800.00	-	6,720.00
	6*1			20,800.00
	2*2			1,560.00
	Corrugated Iron Sheets	13,200.00	-	5,500.00
	Door	2,000.00	-	1,200.00
	Wire	-	-	800.00
	Overhead	-	-	2,000.00
	Labour	1,500.00	-	12,000.00
	Shelves	-	-	4,875.00
	Transport	3,000.00	-	3,000.00
	Nails	400.00	-	-
Padlocks	100.00	-	-	
Hinges	250.00	-	-	
	Total	23,250.00	40,000.00	58,455.00
25-100M ² (5*5-10*10)	Timber 3*2	4,373.60		10500.00
	6*1			32500.00
	2*2			2437.50
	Corrugated Iron Sheets	20,618.40	-	8,593.75
	Door	3,124.00	-	1875
	Wire		-	1250
	Overhead		-	3125
	Labour	2,343.00	-	18758.00
	Shelves		-	7617.188
	Transport	4,686.00	-	3000.00
	Nails	624.80	-	-
	Padlocks	156.20	-	-
	Hinges	390.50	-	-
		Total	36,316.50	60,000.00
100-225 M ² (10*10-15*15)	Timber 3*2	4,550.00	-	42,000.00
	6*1			130,000.00
	2*2			9,750.00
	Corrugated Iron Sheets	21,450.00	-	3,4375.00
	Door	3,250.00	-	7,500.00
	Wire		-	5,000.00
	Overhead		-	12,500.00
	Labour	2,437.50	-	75,000.00
	Shelves		-	30,468.75
	Transport	4,875.00	-	18,750.00
	Nails	650.00	-	-
	Padlocks	162.50	-	-
	Hinges	406.25	-	-
	Total	3,7781.25	80,000.00	365,343.75

Appendix 4-1: Temporary Occupiers of Missing Link Questionnaire (Amended Version)

SOCIAL IMPACT SURVEY ON MISSING LINKS ROADS IMPROVEMENT PROJECT

A Project of the Ministry of Roads and Public Works: The Study on Master Plan for the Urban Transport of the Nairobi Metropolitan Area.

A Questionnaire Administered to Residents and Business People Living along the Missing Links Roads Nos. 3, 6 and 7 in Lavington- Kileleshwa Area

Instructions: Please answer all questions as complete as possible. We appreciate your support and cooperation.

Date of Interview _____ **Missing Link Road No./Name** _____

Section I: Personal Information of the Respondent

1). Name of Respondent: _____

2). Gender: Male Female

3). Age: a. 15 –19 b. 20 –29 c. 30–39 d. 40 -49

e. 50 –59 f. More than 60

4). Marital Status Single Married Other

5). Do you have children? Yes No

if yes , how many? _____

6). Where do your children go to school?

a) Within the project area (Lavington-Kileleshwa)

b) Outside the project area

c) Outside Nairobi

d) Other (specify) _____

7). What is your residential status?

a. House owner

b. Renting Flat/Apartment

c. Other (Please specify): _____

8). How many people are staying in your house?

a. 1 b. 2 c. 3 d. 4 e. 5

f. More than 6

9). What is your occupation at present?

a. Kiosk owner (Daily permit)

b. Kiosk owner (Annual permit)

c. Shop owner (Permanent permit)

d. Office Worker/Shop Keeper

e. Factory Worker

f. Business owner

g. Government worker

h. Other (Please Specify): _____

10). How many people are depending on your occupation?

a. Less 3 between 3 & 5 More than 5

11). Do you own any vehicle?

a Yes b. No

12). If yes to question 11 what kind of a vehicle?

a. Private car

b. Bus/Matatu

c. Motor Cycle

d. Bicycle

e. Truck/Commercial Vehicle

f. Other (Specify) _____

Section II: Information on the Missing Links Roads Improvement Project

1) Have you known of the existence of these missing links in your area?

a. Yes b. No

2) Do you know that the road reserve of the missing links is not your land for development of buildings and farming areas?

a. Yes b. No

3) Missing Link Improvement Project subject to study is indicated as per attached drawing and it is subject to study for engineering design works.

Have you been well informed of the Missing Link Improvement Project?

a. Yes b. No

4) If yes, how did you get the information?

a. Provincial Staff b District Staff c. Location's Staff

d. Community Staff e. Project Staff f. Others

g. If others specify _____

5) Do you accept and agree about the project?

a. Yes b. No

6) If answered "No", please specify the reasons: _____

Section III: Resettlement

1) If you accept the Project, do you agree to resettle in the event that your place is directly affected by the Project?

a. Yes b. No

c. If answered no, please specify: _____

2) If you accept to resettle, where is your preference area to resettle?

a. Near-by area within the location b. Anywhere within the district

- c. Near-by area but different location d. I will move out of the district
- e. Do not want to move out
- f. Other (Please specify): _____

3) If you have to resettle, what is your request?

- a. Find a place to resettle b. Compensation for the business
- c. Compensation for the structures d. Compensation for the land
- e. As per the government regulations
- f. Other (Please specify): _____

Section IV: Value of the Existing Road

1) Do you find the existing road useful?

- a. Yes b. No

2) If answered "Yes", how does it benefit you?

(Please specify): _____

3) If answered "No", what are its the disadvantages?

- a. Road conditions are deteriorating
- b. Deteriorating road emanate excessive dust
- c. It is simply uncomfortable to travel with my car
- d. Deteriorated road does not allow matatu entering to this area
- e. Deteriorating road causes to lower economic productivity
- f. The existing road conditions take me to go to work excessively long time
- g. Others (Please specify): _____

Section V: Present Socio-economic Environment

1) Do you think the existing road contributes to the following?

	Yes	No
a. Residential area development	<input type="checkbox"/>	<input type="checkbox"/>
b. Business area development	<input type="checkbox"/>	<input type="checkbox"/>
c. Educational/Sports community development	<input type="checkbox"/>	<input type="checkbox"/>
d. Tourism industry development	<input type="checkbox"/>	<input type="checkbox"/>
e. Manufacturing industry development	<input type="checkbox"/>	<input type="checkbox"/>
f. Agricultural area development	<input type="checkbox"/>	<input type="checkbox"/>
g. Others (Please specify): _____		

2) What are the main undesirable developments brought about by the present road?

a. Slum area	<input type="checkbox"/>
b. Garbage dump	<input type="checkbox"/>
c. Narrow road impassable for large trucks	<input type="checkbox"/>
d. Increase of traffic congestions	<input type="checkbox"/>
e. Increase of Air/Noise/Vibration Pollution	<input type="checkbox"/>
f. Others (Please specify): _____	

Section VI: Social Impact of the Missing Links Roads Improvement Project

1) Do you foresee any value of contributing factor of the Missing Link Improvement Project to your income?

a. Yes b. No

2) If answered "No", what are your main concerns?

a. Increase of traffic volume	<input type="checkbox"/>
b. Increase of traffic accident	<input type="checkbox"/>

- c. Increase of vehicles causing air/noise pollution
- d. Increase of spillage of oil, sand and gravels, soils, etc.
- e. No significant impact to raise my income
- f. No significant impact to the society as a whole
- g. Other (Please specify): _____

3) If answered "Yes", what are your main concerns of the Missing Link Improvement Project?

- a. Comfortable riding of vehicles
- b. Faster time for commuting to work
- c. Reduced dust and exhaust fumes
- d. Introduction of bus/matatu to this area
- f. Promotion of business
- g. Increase of economic productivity of the society as a whole
- h. Increase of employment opportunities for the construction works
- i. Loss of income
- j. Loss of shelter
- k. Other (Please specify): _____

4) In what ways, do you think, the Missing Link Improvement Project will affect the settlement patterns of this area and economic productivity as a whole?

- | | Yes | No |
|--|--------------------------|--------------------------|
| a. Residential area development will be enhanced | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Business area development will be enhanced | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Educational/Sports community development will be enhanced | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Tourism industry development will be enhanced | <input type="checkbox"/> | <input type="checkbox"/> |

- e. Manufacturing industry development will be enhanced
- f. Agricultural area development will be enhanced
- g. Others (Please specify): _____

5) What are the major undesirable developments that will be brought about by the Missing Link Improvement Project?

- a. Development of further slum area
- b. Increase of garbage dump
- c. No improvement to the near-by narrow road impassable for large trucks
- d. General traffic congestions
- e. Others (Please specify): _____

6) What should be the factor of direct contribution of the Project to this area?

- a. Improved economic productivity
- b. Comfort of commuting
- c. Any conveniences with through traffic
- d. Direct employment of us for the construction works
- e. Other (Please specify): _____

7) For the positive development of this area, what do you think is the best type of new road?

- a. Road without sidewalk
- b. Road with sidewalk without greenbelts/landscaping
- c. Road with sidewalk with greens
- d. Other (Please specify): _____

8) For the positive development of this area, what type of intersection do you think is best for the new road project?

- a. Roundabout system without signal

- b. Roundabout system with signal
- c. Conventional intersection with signal
- d. Conventional intersection without signal
- e. Other (Please specify): _____

We thank you most sincerely for your valuable input to this survey.

Name of the Interviewer: _____

Signature: _____

Date: _____

Appendix 4-2: Permanent Residents/Business Owners Questionnaire (Amended Version)

SOCIAL IMPACT SURVEY ON MISSING LINKS ROADS IMPROVEMENT PROJECT

A Project of the Ministry of Roads and Public Works: The Study on the Master Plan for the Urban Transport of the Nairobi Metropolitan Area.

A Questionnaire Administered to Residents and Business People Living Along the Missing Links Roads Nos. 3, 6 and 7 in Lavington- Kileleshwa Area

Instructions: Please answer all questions as complete as possible. We appreciate your support and cooperation.

Date of Interview _____ **Missing Link Road No./Name** _____

Section I: Personal Information of the Respondent

13). Name of Respondent: _____

14). Gender: Male Female

15). Age: a. 15 –19 b. 20 –29 c. 30 –39 d. 40-49
e. 50 –59 f. More than 60

16). Marital Status Single Married Other

17). Nationality: Kenyan Non- Kenyan

18). House No. _____

19). What is your residential status?

a. House owner

b. Renting/ Leasing

c. Other (please specify): _____

8). What is the size of your household membership?

a. 1 b. 2 c. 3 d. 4 e. 5

f. More than 6

9). Do you own any vehicle?

a Yes b. No

10). If yes to question 9, what kind of a vehicle?

a. Private car

b. Bus/Matatu

c. Motor Cycle

d. Bicycle

e. Truck/Commercial Vehicle

f. Other (please specify) _____

11). Do you work away from your residence?

a Yes b. No

12). If yes to question 11, what means of transport do you use to your place of work?

a) Drive personal car

b) Take public transport

c) Use a bicycle

d) Walk

e) Other (specify) _____

Section II: Social Impact of the Missing Links Roads Improvement Project

1). The government of Kenya proposes to construct the missing link road
No. _____: Do you welcome this proposal?

a Yes b. No

2). If Yes to question 1, what are your main concerns?

a. Comfortable riding of vehicles

b. Faster time for commuting to work

- c. Reduced dust and exhaust fumes
- d. Introduction of bus/matatu to this area
- f. Promotion of business
- g. Increase of economic productivity of the society as a whole
- h. Increase of employment opportunities for the construction works
- i. Other (please specify): _____

3). If No to question 1, what are your main concerns?

- a. Increase of traffic volume
- b. Increase of traffic accidents
- c. Increase of vehicles causing air/noise pollution
- d. Increase of spillage of oil, sand and gravels, soils, etc.
- e. No significant impact to raise my income
- f. No significant impact to the society as a whole
- g. Other (Please specify): _____

4). What is undesirable about the existing condition of missing link? State it (them) below:

- a) _____ b) _____
- c) _____

5). If the missing link road is constructed, what will you do?

- a) Will you continue staying in this area
- b) Will you move way
- c) Other (specify) _____

6). In what ways, do you think, the Missing Links Roads Improvement Project will affect the settlement patterns of this area and economic productivity as a whole?

a. Residential area development will be enhanced

b. Business area development will be enhanced

c. Educational/Sports community development will be enhanced

d. Tourism industry development will be enhanced

e. Manufacturing industry development will be enhanced

f. Agricultural area development will be enhanced

g. Others (please specify): _____

7) For the positive development of this area, what do you think is the best type of new road?

a. Road without sidewalk

b. Road with sidewalk without greenbelts/landscaping

c. Road with sidewalk with greens

d. Other (Please specify): _____

8) For the positive development of this area, what type of intersection do you think is best for the new road project?

a. Roundabout system without signal

b. Roundabout system with signal

c. Conventional intersection with signal

d. Conventional intersection without signal

e. Other (Please specify): _____

Section II General Recommendations

Please provide any general/specific recommendations on this project.

a) _____

b) _____

c) _____

d) _____

We thank you most sincerely for your valuable input to this survey.

Name of the Interviewer: _____

Signature: _____

Date: _____

Less than 1 yr

between 2 & 5 yrs

Over 6 years

Other (specify) _____

9. Where did the occupants come from?

10. In your own opinion what are the major social impacts to the opening of the Missing Links

a). _____

b). _____

c). _____

11. In your own opinion how can the impacts you have mentioned be minimised?

a) _____

b) _____

c) _____

Section III: Issues Pertaining to Resettlement, Policy and Implementation

12. Is there any policy on resettlement/relocation of the people occupying road reserves?

Yes No

13. If yes, how does it work?

a) _____

b) _____

14. Who implements this study?

15. Where might the potential sites for relocation of the affected person be found?

16. Can the Missing Links Roads improvement reduce the traffic congestion in the City?

Yes No

17. If No to 16 above why?

a) _____

b) _____

c) _____

18. What environmental impacts have been/being created by the occupants of the Missing Links Roads

a) _____

b) _____

c) _____

19. Other relevant information on:

i). Missing Link Roads

a) _____

b) _____

ii). Resettlement

a) _____

b) _____

iii). Compensations

a) _____

b) _____

Name of Interviewer: _____ **Signature** _____

Date: _____

***ENVIRONMENTAL IMPACT ASSESSMENT
FOR PRE-FEASIBILITY STUDY ON THE TRAFFIC
FLOW IMPROVEMENT OF THE MASTER PLAN
STUDY FOR URBAN TRANSPORT IN THE
NAIROBI METROPOLITAN AREA.***

VOLUME II

FINAL REPORT

BY

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18/08/2005

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ACRONYMS

EMP- Environmental Management Plan

EMCA- Environmental Management Coordination Act

EIA – Environmental Impact Assessment

UNICEF- United Nations Children Education Fund

UNESCO- United Nations Educational Scientific and Cultural Organization

UNIDO- United Nations Industrial Development Organization

UNDP- United Nations Development Program

NEMA- National Environmental Management Authority

NCC- Nairobi City Council

NHIF- National Hospital Insurance Fund

NMA – Nairobi Metropolitan Area

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**ENVIRONMENTAL IMPACT ASSESSMENT FOR PRE-FEASIBILITY
STUDY ON THE TRAFFIC FLOW IMPROVEMENT OF THE MASTER
PLAN STUDY FOR URBAN TRANSPORT IN THE NAIROBI
METROPOLITAN AREA.**

CHAPTER ONE

1. INTRODUCTION

1.1 Background

This study on the traffic flow improvement of the Master Plan of Urban Transport of the City of Nairobi and its metropolitan area makes further important contributions to the overall Master Plan. This improvement involved:

- Traffic flow improvement of the Railway Station – Moi Avenue to Muranga Road
- Traffic flow improvement of Westland area
- Traffic flow improvement of Pangani area
- Traffic flow improvement option of Muranga Road – Globe Cinema
- Traffic flow improvement option of Ngong Road and Haile Selassie Avenue
- Traffic flow circulation improvement measure of Ngong Road, and
- Traffic flow circulation improvement measure of Nuranga Road – intersection.

There are four major modes of transportation in Kenya for passengers and bulk freight: rail, road, maritime, and air. Of these models, the most important in terms of volume is road transport, with the most important land transport corridor being the route between Nairobi and Mombasa and then the corridor that runs from Nairobi to the west of the country towards Uganda and into the interior of Africa. An efficient transport system is a pre-requisite for the rapid economic development of the country and for improving the quality of life of the people.

However, the transport system of the country is far from satisfactory with low operating speeds, delays, accidents and high operating costs due to the poor condition of the road and rail infrastructures and inadequate capacity of the transport system. Over past decade, spectral development policy of the Government of Kenya has been legislated to implement proper maintenance for its existing road infrastructure. Despite this, the network has deteriorated rapidly during this period. On the other hand, traffic demand has been increasing very rapidly during the past decade and there is now a shortage of road capacity to meet the rising demand.

The present supply to transport is inadequate to meet the increase in traffic demand, in particular in Nairobi Metropolitan Area. Hence, there is need to increase the transport supply. An inadequate supply of the road capacity, road structure and traffic management measures have been causing heavy traffic congestion and traffic accidents. Accordingly, in order to alleviate this situation, construction of missing links and improvement of road structures/facilities and traffic management measures are required. The Government of Kenya decided that in order to solve the transport problems, a comprehensive master plan covering the areas of road network

improvement, public transport and traffic management should be developed with a time horizon of 2025.

Against the foregoing, the Government of Kenya has proposed to improve the roundabouts and intersections in the Nairobi Metropolitan area. These efforts are to reduce traffic congestion especially during peak hours. These intersections are; Westlands, Globe Cinema, Pangani, Muthaiga And Haile.Sellasié - Moi Ave. roundabouts.

The construction/improvement of the roundabouts in the metropolitan area are major development works that require an Environmental Impact Assessment (EIA) in accordance with EMCA No. 8 of 1999 and Regulations made there under Legal Notice 101 of 2003. According to the aforementioned Regulations, the second step in the EIA process in Kenya after screening is preparation of a project report.

1.2 Objectives of the EIA Project Report

The objectives of this project report are:

- i) To facilitate the traffic flow in the Nairobi Metropolitan Areas.
- ii) To identify natural, social and cultural impacts of the proposed project.
- iii) To propose mitigation measures to identified adverse impacts.
- iv) To develop an environmental management plan for the proposed project

1.3 Project EIA Report

The content of this report, therefore, constitute an EIA Project Report as stipulated in Part IV of EMCA no. 8 of 1999. This provision of the said Act states that a proponent shall submit to the Authority, an environmental impact assessment project report incorporating but not limited to the following information-

- i) The proposed location of the project
- ii) A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project:
- iii) The objectives of the project:
- iv) The technology, procedures and processes to be used, in the implementation of the project:
- v) The materials to be used in the construction and implementation of the project:
- vi) The products, by-products and waste generated by the project:
- vii) A description of the potentially affected environment:
- viii) The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative irreversible, short-term and long-term effects anticipated:
- ix) Alternative technologies and processes available and reasons for preferring the chosen technology and processes:

- x) Analysis and alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies.
- xi) An environmental management plan proposing the measures for eliminating, minimising or mitigating adverse impacts on the environment: including the cost, time frame and responsibility to implement the measures;
- xii) Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities or major industrial and other development projects;
- xiii) The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;
- xiv) An identification of gaps in knowledge and uncertainties which were encountered in compiling the information;
- xv) An economic and social analysis of the project;
- xvi) An indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures; and
- xvii) Such other matters as the Authority may require.

The Environmental Impact Assessment study report shall be accompanied by a non-technical summary outlining the key findings, conclusions and recommendations of the study and shall be assigned by the proponent and environmental impact assessment experts involved in its preparation.

1.4 Location Of The Proposed Project – Nairobi City

The proposed project comprises improvement of selected roundabouts and intersections within the Nairobi Central Business District and its environs. These roundabouts/intersections include:

- i) Traffic flow improvement of the area: Railway Station – Moi Avenue to Marang’a Road.
- ii) Traffic flow improvement of Westlands area
- iii) Traffic flow improvement of Pangani area
- iv) Improvement options of Murang’a Road intersection
- v) Improvement options of Ngong Road and Haile Selassie Avenue
- vi) Improvement options of Ngong Road and Kenyatta Avenue
- vii) Circulation improvement measure of Ngong Road
- viii) Circulation improvement measures of Murang’a Road intersection

1.4.1 Historical Background and Functions of the Capital City of Nairobi

Nairobi was founded as a camp in 1896 and acquired its city status in 1950. Historical records indicate that its urban functions started in 1889, when it became the headquarters of the Uganda Railways, and the capital function in 1905 (Tiwari, 1979). In 1934, the first public transport, Kenya Bus Services was set up with a fleet of only two buses. The post-independence wave of rural-urban migration in the 1960s and 1970s brought about serious housing, transport, and waste management problems, which made Nairobi 'an eye-sore' to policy makers and planners. The city is divided roughly into East-West by

the Nairobi and Mathare Rivers. The development has tended to be in lateral east to west direction.

As the capital of Kenya, Nairobi is the administrative, commercial, industrial and socio-cultural centre of the Republic of Kenya. It is the world headquarters of two United Nations agencies, namely the United Nations Environment Programme (UNEP) and the United Nations Centre for Human Settlements (UN-Habitat). It is also the headquarters of several regional offices of United Nations agencies such as UNICEF, UNESCO, UNIDO, UNDP, etc. all of which reinforce Nairobi's importance as cultural meeting point within the Eastern African region due to national and international functions. Nairobi is also the centre of regional tourist and new light industries.

1.4.2 Population of Nairobi City

The population of Nairobi has grown from 120,00 in 1950, then to 350,000 persons in 1963 and to 2.14 million in 1999 with a growth of 4.8 % per annum. The population density of Nairobi currently stands at 3200 persons per km². It is the biggest urban centre in Kenya. The high urban population growth rate has created rapid urban spatial growth and associated problems such as inadequate housing, traffic congestion, environmental degradation, land use conflicts etc.

1.4.3 Topography and Drainage of Nairobi City

Nairobi has a mean altitude of approximately 1700 meters above sea level. Nairobi area is divided into two physiographic units or landforms. The western portion is on high ground (approximately 1700-1800 meters above the sea level) with rugged topography, while the eastern side is generally low (approximately 1600 meters above sea level) and flat.

The main drainage follow the regional slope of the volcanic rocks towards the east, while subsidiary internal drainage into the Rift region is confined to the western part. The lava plains east of a line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits, tuffs and volcanic ash. These plains comprising mainly the Athi plains and the Northern section of the Kapiti Plain extend westwards, rising from 4900feet (1493m) at the Athi River to 6000feet (1829m) in the faulted region near Ngong. They form gently rolling grasslands with a fairly even surface, broken occasionally by low east facing scarps that represent the margins of partly eroded lava flows. Gullies and canyon like gorges, cut into the lavas, have steep walls, such as those along the Mbagathi valley. Further east this valley widens slightly where soft material is being actively eroded (Saggerson, 1991).

1.4.4 Geological Characteristics of Nairobi Metropolitan Area

The rocks on the Nairobi area mainly comprise a succession of lavas and pyroclastics of cainozoic age and overlying the foundation of Folded Precambrian schists and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. All formations are covered by deep soils and gravel of quaternary age. Within the rift, loess and lacustrine deposits, some containing diatomaceous beds, reflect major changes in climatic conditions.

1.4.5 Soils of Nairobi Metropolitan Area

The soils of the Nairobi area are products of weathering of mainly volcanic rocks under relatively high temperature and rainfall, good drainage prevailing in the Kikuyu highlands in the west and poor drainage conditions typifying the Athi plains in the east. Weathering in the former case has produced red soils that reached more than 50 feet (15m) in thickness (Saggerson, 1991).

1.4.6 Climate of the City of Nairobi

The climatic conditions of Nairobi largely follow the national trends. The highest rainfall is experienced between March and May and the short rainfall season occurs between October and December. The mean annual rainfall ranges between 850 and 1050 mm. It is usually dry between June and August, while the hottest months are January and February. Mean daily temperatures range between 12C and 26C, while the mean monthly humidity varies between 36% and 55%.

1.4.7 Land Use of Nairobi Metropolitan Area

Land in Nairobi Metropolitan area is utilized for residential, industrial, infrastructure, commercial, urban agriculture, recreational, institutions, water bodies and national parks and forest reserves (Figure 1.1). Land-use statistics presented in Table 1.1 below show that the highest percentage (28.6%) of Nairobi area is open land, meaning that it has not been put into any use yet. Sizable land is also utilised for Residential (25.3%), forests and National Park (21.7%) and Agriculture (13.8%). The remaining portion is shared among recreation, industrial/commercial/service centres, infrastructure and water bodies.

Urban land use, which refers to spatial distribution of activities within urban area, is an important factor in effective urban planning and management. Land use is one of the aspects that indicate the severity of the urban problems mentioned. Up-to-date land use inventory becomes a requirement that facilitates urban planning, growth pattern, and monitoring.

Land Use Map of Nairobi

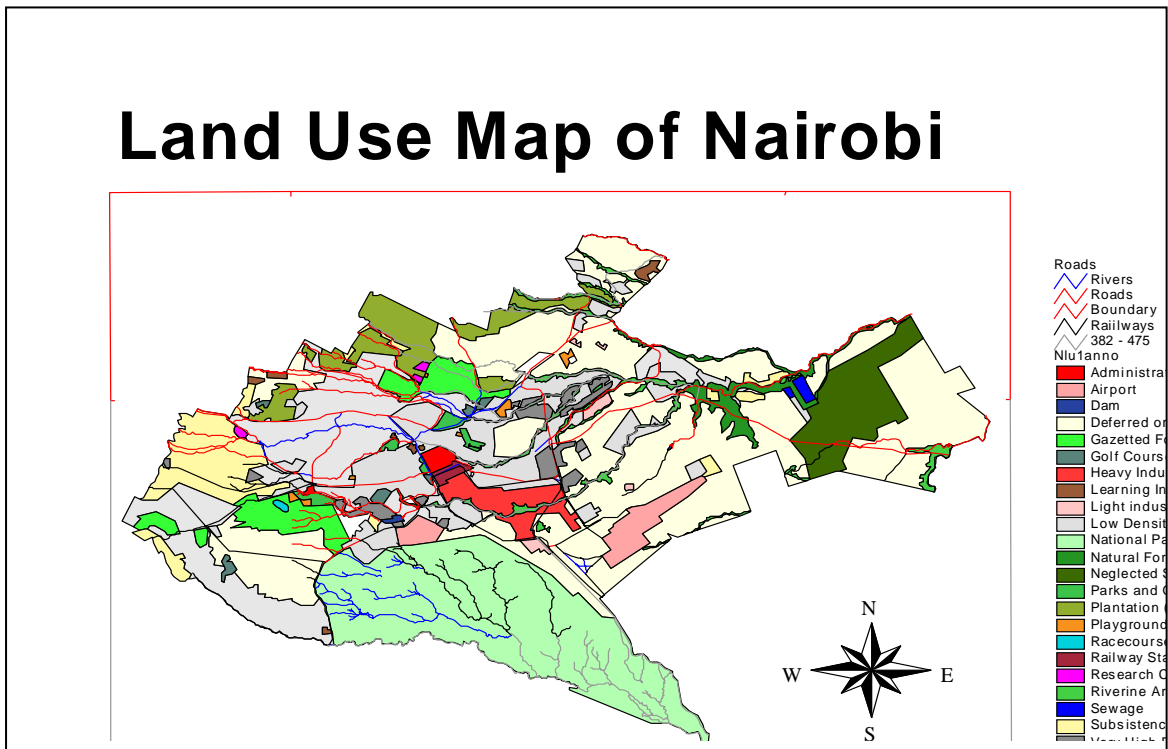


Figure 1.1: Land Use Map of Nairobi Metropolitan Area (Nyabenge 1994)

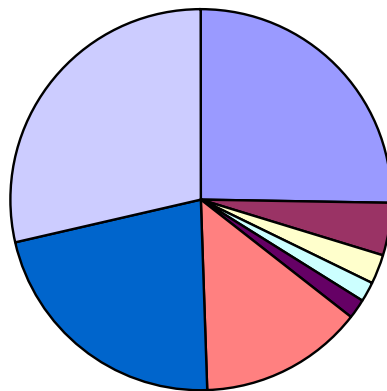


Figure 1.2: Area And Percentage Cover Of Land Use Types

Table 1.1: Area And Percentage Cover Of Land Use Types

Land Use Type	Area (km²)	Cover (%)
Residential	175.6	25.3
Very high dense habitation	11.3	1.6
High dense habitation	10.8	1.6
Medium dense habitation	10.9	1.6
Low dense habitation	52.5	7.5
Very low dense habitation	90.1	13.0
Industrial/commercial/service centres	31.8	4.4
Heavy industrial concentration	7.9	1.1
Light industrial concentration	10.4	1.5
Quarry	4.4	0.6
Administration and Commercial (or CBD)	2.8	0.4
Research Centres	1.1	0.1
Learning Institutions	3.9	0.6
Hospital(s)	1.3	0.2
Infrastructure	15.9	2.3
Airport	12.8	1.8
Railway Station	1.7	0.2
Sewage plants	1.4	0.2
Recreation	128.4	18.5
National park	116.4	16.5
Parks/Gardens	5.6	0.8
Golf Course	2.7	0.5
Play Grounds	2.2	0.3
Race Course	0.9	0.1
Drive-in Cinema	0.6	0.1
Water body	0.4	0.1
Dams	0.4	0.1
Agricultural	96.8	13.8
Subsistence Crops	30.8	4.4
Plantation (Tea, Coffee)	35.7	5.1
Neglected Sisal/Rangelands	30.2	4.3
Others	247.1	35.4
Gazetted Forest	24.8	3.5
Riverine Area	11.4	1.6
Ungazetted Forest	12.1	1.7
Open land	198.8	28.6

1.8 General Natural Environment of the City of Nairobi

There are various conservation areas in the Nairobi Metropolitan Area (NMA) include two national parks, forest areas, and city parks.

1.8.1 National Parks:

Within the NMA with the land area of 117km². The Oldonyo Sabuk National Park is in the east of the NMA, and has the land area of 18.5km².

Nairobi City's Parks and Conservation Areas: The Nairobi Arboretum is located to the north of the State House. Two city parks of the Uhuru and the Central are fronting on the west side of the Uhuru highway. Depending on the way selected projects are designed, a part of these parks may be directly affected. The Nairobi City park is in the north of Nairobi City on the Forest road to the south and the Limuru road to the northwest. This is the Nairobi residents' most popular part of weekend outing. The Jeevanjee Park is facing the Moi Avenue. It is the smallest city park in the middle of congested downtown business district.

1.8.2 Forest Areas:

Forest areas existing in the NMA are summarized in the Table 1.2 .

Table 1.2 Forest Areas Within The Study Area

Forest Area	Location	Area (ha)	Considerations for the Master Plan
Ngong Road	Western part of Nairobi City	1,189.5 ha	It may be partly affected by the Southern Bypass Project.
Dagoretti	Just outside of Nairobi City	764 ha	It may be partly affected by the Southern Bypass Project
Ololua	Just outside of Nairobi City	667.7 ha	A quarter of the forest is a natural forest with a variety of wildlife, which has been studied.
Ngong Hill	Western end of the NMA.		
Embakasi	Immediately southwest of Dagoretti Forest	573 ha	
Muguga	Western end of the NMA	225.3 ha	
Kamiti	Northern part of the NMA	169.6 ha	
Kiambu	Northern part of the NMA	79.3 ha	
Karura	Northern part of Nairobi City	956.1 ha	The headquarters of the Forest Department is located in the forest are.
Mateteni, Kithatani and Ngulini	Machakos District		These are district forests known as trust land.

CHAPTER TWO

2. NATIONAL LEGISLATIVE AND REGULATORY FRAMEWORK

2.1 Procedures of EIA

The following are the procedures of the EIA according to the Regulations:

- i) All of the environmental impact assessment activities in Kenya should be carried out by “Lead Expert” registered with the National Environmental Management Authority;
- ii) Lead expert entrusted by project proponents should elaborate a “Project Report” as a project proposal containing the outline of the project and identifying the potential environmental impacts and submit it to NEMA;
- iii) NEMA examines the “Project Report” and it is required to comment on the report within 45 days;
- iv) Based on NEMA’s comments on the “Project Report”, the proponent is to implement the project:
 - a. Without EIA study as it is exempt from full EIA but carry out monitoring of the conditions of approval;
 - b. Acceptance of proposal;
 - c. Advice for revisions; or
 - d. Rejection.
- v) If EIA study was requested to carry out, “Terms of Reference” which contains basic requirement of the EIA guidelines should be prepared by the project proponent and submitted to NEMA for approval. There is no fixed period for comment by NEMA but might take for 45 – 60 days in general;
- vi) EIA report, which usually runs for 3 - 6 months depending on the covering area and intensity of study, the following should be covered by the registered lead experts of EIA in Kenya.
 - a) Sources of impact;
 - b) Project inputs;
 - c) Project activities;
 - d) Area of impacts on the natural and human environments;
 - e) Environmental impacts (General impacts on the natural and human environments);
 - f) Environmental guidelines and standards (National legislation, international guidelines, international conventions and treaties);
 - g) Mitigation measures;
 - h) Environmental management plan; and
 - i) Environmental Monitoring and Auditing.
- vii) Upon receipt of EIA report, NEMA assesses it within 60 days for further comments unless otherwise EIA license issued.

CHAPTER THREE

3. METHODOLOGY

3.1 Terms of Reference for the Project Report

The terms of reference developed by the proponent for the EIA project report were as follows:

- i) Study on Environmental Implications of the improvement of the roundabouts and intersections as indicated below:
 - a) Traffic flow improvement of the area at intersection of Ngong Road and Haile Selassie Avenue;
 - b) Traffic flow improvement of the area from Railway Station to Moi Avenue to Muranga Road;
 - c) Traffic flow improvement of Westlands area; and
 - d) Traffic flow improvement of Pangani area
- ii) In relation to the above, flow of public transportation is improved and their circulation could be changed according to the road improvement. Study therefore explicitly on the environmental implications of the above traffic flow improvement including psychological and behavioural changes that may take upon pedestrians, private car drivers, bus and matatu drivers and others who use the improved sections of the road in Nairobi.
- iii) Study on Natural Environment based on the Master Plan Study report and the field observation, identify fauna and flora directly affected by the selected projects subject to pre-feasibility study and present them in a form of which scientific names, English names and local names are shown where appropriate.

3.2 Design and Methodology

The Environmental Management and Co-ordination Act (EMCA) o. 8 of 1999 and the Environmental Impact Assessment (EIA) Regulations indicate factors, which must be considered in conducting an EIA study and preparing the EIA study report. For the purpose of this study the consultants used methodologies and data collection techniques, which were amendable to the various types of information/data required. The methodologies used were as follows:

- i) Literature review.
- ii) Field visits (reconnaissance) at the beginning of the study to learn of the study area and sites.
- iii) Visual observations at the proposed sites
- iv) Use of photographs of scenery to obtain permanent records of observations.
- v) Walk - through Information checklists.
- vi) Impact identification using matrices and expert/professional assessment.

- vii) Confirmation and sharing of preliminary findings with the proponent and other relevant EIA experts.
- viii) Constant review of various drafts reports.

3.3 Instruments for Data Collection and Procedures

Several techniques and instruments were used in gathering data. The following is a description of the instruments that were used, the procedures used in their administration, together with other procedures used to collect other supplementing information.

3.3.1 Literature Review Guide

A list of potential sources of data and information for this study was compiled by the consultants. The list was used to guide the consultants in identifying the relevant information. Some of the sources are cited and appear in the list of references.

3.3.2 Walk Through Observation Checklists

Consultants made and recorded observations during both the preliminary and detailed follow-up field study visits. The observations focused on natural environments and social environments, e.g. vegetation, streams, temporary shelters, permanent residents/ businesses, jua kali garages, kiosks, and vendors on open air.

CHAPTER FOUR

4. PROPOSED ENVIRONMENTAL MANAGEMENT PLANS FOR IMPROVEMENTS

4.1 Proposed Improvements for Roundabouts and Intersections

The proposed EMP for the improvements of the roundabouts is as follows:

4.1.1 Traffic Flow Improvement Of The Area: Railway Station-Moi Avenue To Muranga Road.						
	No.	Aspect of environment	Rating	With Project Explanation	Rating	Without Project Explanation
SOCIAL ENVIRONMENT	1	Resettlement	-	No resettlement	-	Not applicable
	2	Regional economy	-	No small shops & stall need to be relocated	-	Not applicable
	3	Transport & life facilities	++++	Crosswalks should be improved	---	Past trend of transport & utility should prevail
	4	Regional communities	-	No shops/commercial premises need to be moved	-	Not applicable
	5	Archaeological & cultural resources	-	No such resources are known to exist	-	Not applicable
	6	Water rights & communal land	-	No such right/common is known to exist	-	Not applicable
	7	Health & sanitation	-	Inflow of construction workers will have little effect as this is already an urban area	---	Air pollution may worsen at intersection
	8	Solid wastes	--	Construction waste will be generated	-	Not applicable
	9	Disaster Risk	++++	Traffic accidents will greatly be reduced	-	Traffic congestion should chronically congest further
NATURAL ENVIRONMENT	10	Topography & Geology	-	No effect is foreseen	-	Not applicable
	11	Soil Erosion	-	No effect is foreseen	-	Not applicable
	12	Ground water	-	No effect is foreseen	-	Not applicable
	13	River & surface water regime	-	No effect is foreseen	-	Not applicable
	14	Fauna & flora	-	No effect is foreseen	-	Not applicable
	15	Meteorology	-	No effect is foreseen	-	Not applicable
	16	Landscape	-	No effect is foreseen	-	Not applicable
POLLUTION	17	Air pollution	-	No effect is foreseen	-	Not applicable
	18	Water pollution	-	No effect is foreseen	-	Not applicable
	19	Soil contamination	-	No effect is foreseen	-	Not applicable
	20	Noise & vibration	-	No effect is foreseen	-	Not applicable
	21	Land subsidence	-	No effect is foreseen	-	Not applicable
	22	Offensive odour	-	No effect is foreseen	-	Not applicable

Key:

Negative Impact - - - - high - - - medium - - low - little or no impact

Positive Impacts + + + + high + + + medium + + low

4.1.2 Traffic Flow Improvement Of Westlands Area						
	No.	Aspect of environment	Rating	With Project Explanation	Rating	Without Project Explanation
SOCIAL ENVIRONMENT	1	Resettlement	---	Some shops/kiosks may move out of the area, widening will be within the right-of-way	+++	No part of the local community is affected but chronic traffic congestion is not solved at all
	2	Regional economy	---	Small shops and stalls need to be relocated	+++	Past trend of regional economy will prevail
	3	Transport & life facilities	++++	Cross walks should be improved	---	Past trend of transport and utility should prevail
	4	Regional communities	++++	Positive effects are expected	---	Community members to chronically suffer from the traffic issues
	5	Archaeological & cultural resources	-	No such resources are known to exist	-	Not applicable
	6	Water rights & communal land	-	No such right is known to exist	-	Not applicable
	7	Health & sanitation	-	Inflow of construction workers will have little effect as this is already an urban area	-	Not applicable
	8	Solid wastes	--	Construction waste will be generated	-	Not applicable
	9	Disaster risk	++++	Traffic accidents will greatly be reduced	---	Traffic congestion should chronically congest further
NATURAL ENVIRONMENT	10	Topography & geology	-	No effect is foreseen	-	Not applicable
	11	Soil Erosion	-	No effect is foreseen	-	Not applicable
	12	Ground water	-	No effect is foreseen	-	Not applicable
	13	River & surface water regime	-	No effect is foreseen	-	Not applicable
	14	Fauna & flora	---	Some trees will be removed	-	Not applicable
	15	Meteorology	-	Project scale is small	-	Not applicable
	16	landscape	---	Roundabout with greenery will be affected	+++	Hitherto familiar landscape of roundabout would be maintained
POLLUTION	17	Air pollution	---	Air pollution will temporarily increase by construction vehicles	---	Chronic air pollution should prevail in future
	18	Water pollution	-	No effect is foreseen	-	Not applicable
	19	Soil contamination	-	No such possibility is foreseen	-	Not applicable
	20	Noise & vibration	---	Noise may increase due to increased traffic	---	Present noise and vibration should prevail in future
	21	Land subsidence	-	No effect is foreseen	-	Not applicable
	22	Offensive odour	---	Vehicle emission will cause some offensive odour	---	Chronic air pollution should prevail in future

Key:

Negative Impact - - - - high - - - medium - - low - little or no impact
Positive Impacts + + + + high + + + medium + + low

4.1.3 Traffic Flow Improvement Of Pangani Area

	No.	Aspect of environment	Rating	With Project Explanation	Rating	Without Project Explanation
SOCIAL ENVIRONMENT	1	Resettlement	-	No resettlement	-	Not applicable
	2	Regional economy	-	No small shops and stalls need to be relocated	-	Not applicable
	3	Transport & life facilities	++++	Crosswalks should be improved	---	Past trend of transport and utility should prevail
	4	Regional communities	-	No shops/commercial premises need be moved	-	Not applicable
	5	Archaeological & cultural resources	---	World War one memorial may be affected	-	Not applicable
	6	Water rights & communal land	--	No such right is known to exist	-	Not applicable
	7	Health & sanitation	-	Influx of construction workers will have little effect as this is already an urban area	-	Not applicable
	8	Solid wastes	--	Construction waste will be generated	-	Not applicable
	9	Disaster risk	---	Traffic accidents may increase	---	Traffic congestion should chronically congest further
NATURAL ENVIRONMENT	10	Topography & geology	-	No effect is foreseen	-	Not applicable
	11	Soil erosion	-	No effect is foreseen	-	Not applicable
	12	Ground water	-	No effect is foreseen	-	Not applicable
	13	River & surface water regime	-	No effect is foreseen	-	Not applicable
	14	Fauna & flora	--	Portion of the existing greenery will be lost	+++	No change should take place i.e., present conditions are maintained
	15	Meteorology	-	No effect is expected	-	Not applicable
16	Landscape	----	Roundabout with greenery will be removed or affected	++++	Hitherto familiar landscape of roundabout would be maintained	
POLLUTION	17	Air pollution	---	Air pollution will temporarily increase due to construction vehicles	---	Chronic air pollution should prevail in future
	18	Water pollution	-	No effect is foreseen	-	Not applicable
	19	Soil contamination	-	No such possibility is foreseen	-	Not applicable
	20	Noise & vibration	---	Noise may increase due to increased traffic	---	Present noise and vibration should prevail in future
	21	Land subsidence	-	No effect is foreseen	-	Not applicable
	22	Offensive odours	---	Vehicle emission will cause some offensive odour.	---	Present air/odour pollution should prevail

Key:

Negative Impact ---- high --- medium -- low - little or no impact
Positive Impacts ++++ high +++ medium ++ low

4.1.4 Improvement Options of Muranga Road – Intersection						
	No.	Aspect of environment	Rating	With Project Explanation	Rating	Without Project Explanation
SOCIAL ENVIRONMENT	1	Resettlement	-	No resettlement	-	Not applicable
	2	Regional economy	-	No small shops and stalls need to be relocated	-	Not applicable
	3	Transport & life facilities	++	Crosswalks should be improved	--	Present transport should prevail
	4	Regional communities	-	No shops/commercial premises need be moved	-	Not applicable
	5	Archaeological & cultural resources	-	No such resources are known to exist	-	Not applicable
	6	Water rights & communal land	----	Nairobi River will be affected	--	Present situation should prevail
	7	Health & sanitation	---	Influx of construction workers will have little effect as this is already an urban area : Sanitation would impact heavily on Nairobi River	--	Present situation should prevail
	8	Solid wastes	----	Construction waste will be generated: Bus/Matatu termini will generate a lot of waste	--	Present situation should prevail
	9	Disaster risk	+++	Traffic accidents will be reduced	--	Present situation should prevail
NATURAL ENVIRONMENT	10	Topography & geology	-	No significant impact is expected	-	Not applicable
	11	Soil erosion	-	No effect is foreseen	-	Not applicable
	12	Ground water	-	No effect is foreseen	-	Not applicable
	13	River & surface water regime	----	Due to the proposed Matatu / Bus termini Nairobi River will be greatly affected	--	Present situation should prevail
	14	Fauna& flora	---	Portion of the existing greenery will be lost	+++	No change should take place i.e., present conditions should prevail
	15	Meteorology	-	No effect is expected	-	Not applicable
POLLUTION	16	Landscape	---	Roundabout with greenery will be removed or affected	+++	Hitherto familiar landscape of roundabout would be maintained
	17	Air pollution	----	Increased pollution due to the concentration of bus / Matatus	+++	Present situation should prevail
	18	Water pollution	----	Due to the Bus / Matatu termini being near the Nairobi River pollution will increase	--	Present situation should prevail
	19	Soil contamination	-	No effect is foreseen	-	Not applicable
	20	Noise & vibration	----	Due to bus / matatu termini noise pollution will increase	--	Present situation should prevail
	21	Land subsidence	-	No effect is foreseen	-	Not applicable
	22	Offensive odour	----	Increase of bus / matatu will result in increased offensive odour	--	Present situation should prevail

Key:

Negative Impact ---- high --- medium -- low - little or no impact
Positive Impacts ++++ high +++ medium ++ low

4.1.5 Improvement Option of Ngong Road and Haile Selassie Avenue

No	Aspect of environment	Rating	With Project Explanation	Rating	Without Project Explanation
SOCIAL ENVIRONMENT	1 Resettlement	-	No resettlement	-	Not applicable
	2 Regional economy	-	No small shops and stalls need to be relocated	-	Not applicable
	3 Transport & Life facilities	++	Crosswalks should be improved	--	Present transport should prevail
	4 Regional communities	-	No shops/commercial premises need be moved	-	Not applicable
	5 Archeological & cultural resources	-	No such resources are known to exist	-	Not applicable
	6 water right & communal land	-	No such right is known to exist	-	Not applicable
	7 Health+sanitation	-	Influx of construction workers will have little effect as this is already an urban area	-	Not applicable
	8 solid wastes	---	Construction waste will be generated	-	Not applicable
	9 Disaster Risk	+++	Traffic accidents will be reduced	---	Present congestion and accidents should prevail
NATURAL ENVIRONMENT	10 Topography&Geology	-	No significant impact is expected	-	Not applicable
	11 Soil Erosion	-	No effect is foreseen	-	Not applicable
	12 Ground water	-	No effect is foreseen	-	Not applicable
	13 River & surface water regime	-	No effect is foreseen	-	Not applicable
	14 Fauna& flora	---	Portion of the existing greenery will be lost	+++	No change should take place i.e present conditions are maintained
	15 Meteorology	-	No effect is foreseen	-	Not applicable
POLLUTION	16 landscape	---	Island greenery will be removed	+++	Familiar landscape of island would be maintained
	17 Air pollution	--	Air pollution will temporarily increase due to construction vehicles	---	Chronic air pollution should prevail
	18 Water pollution	-	No effect is foreseen	-	Not applicable
	19 Soil contamination	-	No effect is foreseen	-	Not applicable
	20 Noise & Vibration	---	Noise may increase due to increased traffic	---	Present noise and vibration should prevail
	21 Land subsidence	-	No effect is foreseen	-	Not applicable
	22 Offensive odour	---	Vehicle emission will cause some offensive odour	---	Present odour pollution should prevail

Key:

Negative Impact - - - - high - - - medium - - low - little or no impact
Positive Impacts + + + + high + + + medium + + low

4.1.6 Improvement option of Ngong Road and Kenyatta Avenue

No	Aspect of environment	Rating	With Project Explanation	Rating	Without Project Explanation
SOCIAL ENVIRONMENT	1 Resettlement	-	No resettlement	-	Not applicable
	2 Regional economy	-	No small shops and stalls need to be relocated	-	Not applicable
	3 Transport & life facilities	++++	Crosswalks should be improved	---	Past trend of transport and utility should prevail
	4 Regional communities	-	No shops/commercial premises need be moved	-	Not applicable
	5 Archaeological & cultural resources	-	No such resources are known to exist	-	Not applicable
	6 Water rights & communal land	-	No such right is known to exist	-	Not applicable
	7 Health & sanitation	-	Influx of construction workers will have little effect as this is already an urban area	-	Not applicable
	8 Solid wastes	--	Construction waste will be generated	-	Not applicable
	9 Disaster Risk	-	Traffic accidents will be reduced	---	Present congestion and accidents should prevail
NATURAL ENVIRONMENT	10 Topography & geology	-	No significant impact is expected	-	Not applicable
	11 Soil Erosion	-	No effect is foreseen	-	Not applicable
	12 Ground water	-	No effect is foreseen	-	Not applicable
	13 River & surface water regime	-	No effect is foreseen	-	Not applicable
	14 Fauna & flora	--	Portion of the existing greenery will be lost	++	No change should take place i.e., present conditions are maintained
	15 Meteorology	-	No effect is foreseen	-	Not applicable
16 Landscape	---	Island greenery will be removed or affected	+++	Familiar landscape of island would be maintained	
POLLUTION	17 Air pollution	--	Air pollution will temporarily increase due to construction vehicles	---	Chronic air pollution should prevail
	18 Water pollution	-	No effect is foreseen	-	Not applicable
	19 Soil contamination	-	No effect is foreseen	-	Not applicable
	20 Noise & vibration	---	Noise may increase due to increased traffic	---	Present noise and vibration should prevail
	21 Land subsidence	-	No effect is foreseen	-	Not applicable
	22 Offensive odour	---	Vehicle emission will cause some offensive odour	---	Present odour pollution should prevail

Key:

Negative Impact ---- high --- medium -- low - little or no impact
Positive Impacts ++++ high +++ medium ++ low

4.2 Traffic Flow Improvement of the Areas

4.2.1 Improvements of Railway Station: Moi Avenue to Murang'a Road

- i) Scoping
All negative impacts ranked medium and high were considered significant. For this junctions, key are as follows: In reference to solid waste, Construction waste will be generated

<u>Impact</u>	<u>Mitigation Measures</u>
Construction waste generated	- Closely match the demand and order for materials needed for construction to avoid wastage - Dispose of all waste in approved areas approved by Nairobi City Council

- ii) Environmental management Plan (EMP)

Expected Environmental Impacts	Mitigation Measurers	Responsibility	Means of monitoring	Monitoring frequencies
Construction Waste generated	Ensure efficient safe collection and disposal	- Constructor - Nairobi City Council - Supervising Engineer - NEMA	- Sight Agent - Resident Engineer - Visit Public Health Inspector	- Daily - Daily - Twice a Month

4.2.2 Traffic Flow Improvement of Westlands Area

- i) Scoping

All negative impacts ranked medium and high were considered significant. For this roundabout they are as follows.

- | | |
|--------------------------|--|
| a) Resettlement | Small shops/kiosks will be relocated |
| b) Loss of fauna & flora | Some trees will be cut |
| c) Loss of landscape | The size of round about will be reduced |
| d) Air pollution | Will increase due to construction vehicles |
| e) Noise Vibration | Will increase due to construction vehicles |
| f) Offensive Odour | Will increase due to construction vehicles |
| g) Solid Waste | Construction waste will be generated |

<u>Impacts</u>	<u>Mitigation Measures</u>
a) Resettlement	- Nairobi City Council should identify alternative sites for relocated shops and kiosks
b) Loss of Fauna & Flora	- Plant trees and grass on reduced central and splinter islands - Landscape all disturbed areas.

- c) Loss of landscape
 - Landscape all disturbed areas
 - Plant trees and grass on reduced central and splitter islands
- d) Air, dust, and noise pollution
 - Working with noise abatement gear (ear mufflers)
 - The construction site will be screened.
 - Switch off vehicle engines when not in use.
 - Spray of water during the construction work
 - Install dust scrubbers on the exhaust of emitting machinery to reduce smoke pollution.
 - Regular maintenance of construction plant and equipment
- e) Solid wastes
 - Closely match the demanded order for materials needed for construction to avoid wastage.
 - Dispose of all waste in approved areas (NCC disposal site)

ii) EMP for Westland's Area

Expected Environmental Impacts	Mitigation measures	Responsibility	Means of monitoring	Monitoring frequencies
a) Resettlement	- Get alternative location for kiosks/shops	NCC	Follow/policy Resettlement plan	Regularly
b) Loss of Fauna & Flora Landscape	- Plant more trees and grass on reduced central an splitter islands - Landscape all disturbed areas.	-Contractor -Supervising engineer - NCC - NEMA	Carry out annual environmental audits	Annual
d) Air, dust and noise pollution	- Working with noise abatement gear - The construction site will be screened - Switch off vehicle engines when not in use. - Spray of water during the construction work - Install dust scrubbers on the exhaust of emitting machinery to reduce smoke pollution. - Regular maintenance of construction plant and equipment	-Contractor -Surveying engineer - Nairobi City Council -NEMA	- Site Agent & Resident engineer visit - Public health inspections - Labour officers	- Daily visits - Monthly visits - Monthly
e) Construction solid waste	- Ensure efficient safe collection and disposal	<ul style="list-style-type: none"> • Construction • NCC • Supervising Engineer • NEMA 	- Site Agent visits - Resident Engineer visits - Visit by Public Health inspector	-Daily - Daily - Twice a month

4.2.3 Traffic Fow Improvement of Pangani Area

- i) Scoping
All negative impacts ranked medium and high were considered significant. For this roundabout they are as follows.

- a) Archaeological & cultural resources -World war memorial may be affected
- b) Air, noise, noise pollution -Will increase due to construction vehicles
- c) Flora & Fauna -Loss of flora & Fauna
- d) Landscape -Loss of landscape
- e) Solid waste -Construction waste will be generated

Impacts

Mitigation Measures

- a) Air, dust, and noise pollution -Working with noise abatement gear (ear mufflers)
-The construction site will be screened.
-Switch off vehicle engines when not in use.
-Spray of water during the construction work
-Install dust scrubbers on the exhaust of emitting machinery to reduce smoke pollution.
-Regular maintenance of construction plant and equipment
- b) Loss of Fauna & Flora Plant trees and grass on reduced central and splinter islands
-Landscape all disturbed areas.
- c) Loss of landscape -Landscape all disturbed areas
-Plant trees and grass on reduced central and splitter islands
- d) Solid wastes -Closely match the demanded order for materials needed for construction to avoid wastage.
-Dispose of all waste in approved areas (NCC disposal site)

ii) EMP for Pangani Area

Expected Environmental Impacts	Mitigation measures	Responsibility	Means of monitoring	Monitoring frequencies
World War Memorial	Design the roundabout to leave the memorial intact	-Designing engineer -National Museums of Kenya (NMK)		
Air, noise & odour pollution	-Working with noise abatement gear -The construction site will be screened -Switch off vehicle engines when not in use. -Spray of the construction work - Install dust scrubbers on the exhaust of emitting machinery to reduce smoke pollution. - Regular maintenance of construction plant and	-Contractor -Surveying engineer - Nairobi City Council - NEMA	Site Agent & Resident engineer visit - Public health inspections - Labour officers	- Daily visits - Monthly visits - Monthly

	equipment			
Flora & Fauna & landscape	-Plant more trees and grass on reduced central an splitter islands - Landscape all disturbed areas	-Contractor -Supervising engineer - NCC - NEMA	Carry out annual environmental audits	Annual
Construction solid waste	-Ensure efficient safe collection and disposal	<ul style="list-style-type: none"> • Constructor • NCC • Supervising Engineer • NEMA 	- Site Agent visits - Resident Engineer visits - Visit by Public Health inspector	-Daily - Daily - Twice a month

4.2.4 Improvement Options for Murang’a Road – Globe Cinema Intersection

i) Scoping

All negative impacts ranked medium and high were considered significant. For this intersection they are as follows.

- a) Water rights Nairobi River will be affected
- b) Sanitation Sanitation would impact heavily on Nairobi river
- c) River Pollution Due to the Bus/matatu Terminus river will be greatly affected.
- d) Flora & Fauna, landscape Some greenery will be lost.
- e) Air, Noise, water, odour Pollution Due to the Matatu/Bus terminus will increase pollution

ii) EMP Murang’a Road – Intersection

Expected Environmental Impacts	Mitigative measures	Responsibility	Means of monitoring	Monitoring frequencies
Air, dust and noise pollution	Working with noise abatement gear. - Construction site will be screened - Switch off vehicle engines when not in use. - Spray of water during the construction work - Install dust scrubbers on exhaust of emitting machinery to reduce smoke pollution. - Regular maintenance of construction plant and equipment	-Contractor -Supervising engineer - Nairobi City Council - NEMA	- Site Agent & Resident Engineer visit - Public health inspections - Labour officer	- Daily visits - Monthly visits - Monthly Visits
Construction waste	Ensure Efficient safe collection and disposal	- Constructor - NCC - Supervising Engineer - NEMA	- Site Agent visits - Resident Engineer visits - Visit by Public Health inspector	- Daily - Daily - Twice a month

Solid waste generated by passengers awaiting to board bus/matatu	-Ensure efficient and safe collection and disposal -Create public awareness on littering -Install waste receptacles	- NCC - NEMA - Public Health - Inspector	Visit by inspectors Regularly/ Daily	Monthly
Liquid waste	-Empty waste water to city storm water drains and sewer line -Design engineer	NCC NEMA	Site visits	Weekly
Flora & Fauna landscape	-Plant more trees and grass on reduced central an splitter islands - Landscape all disturbed areas.	-Contractor -Supervising engineer - NCC - NEMA	Carry out annual environmental audits	Annual

4.2.5 Improvement option of Ngong Road and Haile Selassie Avenue

- i) Scoping
All negative impacts ranked medium and high were considered significant. For this roundabout they are as follows.
- Solid waste will be generated
 - Landscape – flora & fauna will be lost
 - Noise & odour pollution will be generated

ii) EMP for Ngong Road & Haile Selassie Avenue

Expected Environmental Impacts	Mitigation measures	Responsibility	Means of monitoring	Monitoring frequencies
Construction waste	Ensure Efficient safe collection and disposal	- Construction - Nairobi City Council - Supervising Engineer - NEMA	- Site Agent visits - Resident Engineer visits - Visit by Public Health inspector	-Daily - Daily - Twice a month
Flora & fauna & landscape	- Plant more trees and grass on reduces central an splitter islands - Landscape all.	-Contractor -Supervising engineer - Nairobi City Council - NEMA	Carry out annual environmental audits	Annual
Air, dust, and noise, pollution	- Working with noise abatement gear. The construction site will be screened - Switch off vehicle engines when not in use. - Spray of water during the construction work - Install dust scrubbers on exhaust of emitting machinery to reduce smoke pollution. - Regular maintenance of construction plant and equipment	-Contractor -Surveying engineer - Nairobi City Council -NEMA	- Site Agent - Resident engineer visit - Public health inspections - Labour officer	- Daily visits - Monthly visits - Monthly visits - Monthly visits

4.2.6 Improvement Option Of Ngong Road & Kenyatta Avenue/Valley Road

- i) Scoping
All negative impacts ranked medium and high were considered significant. For this intersection they are as follows.
- a) Solid wastes
 - b) Fauna & Flora Landscape
 - c) Air, Noise, odour pollution
- ii) EMP for Ngong Road & Kenyatta Avenue

Expected Environmental Impacts	Mitigation measures	Responsibility	Means of monitoring	Monitoring frequencies
Construction waste	- Ensure efficient safe collection and disposal	- Construction - Nairobi City Council - Supervising Engineer -NEMA	- Site Agent visits - Resident Engineer visits - Visit by Public Health inspector	-Daily - Daily - Twice a month
Flora & Fauna landscape	- Plant more trees and grass on reduces central an splitter islands - Landscape.	-Contractor -Surveying engineer - NCC - NEMA	Carry out annual environmental audits	Annual
Air, Noise, Oduor pollution	-Working with noise abatement gear - Switch off vehicle engines when not in use. -Spray of the traction work. - Install dust scrubbers on exhaust of emitting machinery to reduce smoke - Regular maintenance of construction plant and equipment	-Contractor -Supervising engineer - Nairobi City Council -NEMA	- Site Agent &Resident engineer visit - Public health inspections - Labour officer	- Daily visits - Monthly visits - Monthly Visits

CHAPTER FIVE

5. ENVIRONMENTAL EXAMINATION AND SOCIAL IMPLICATIONS OF THE PROPOSED IMPROVEMENTS IN THE ROUNDABOUTS AND INTERSECTIONS- A FLORISTIC SURVEY

5.1 An Overview

A number of roundabouts and road interjections have been marked for improvements and alterations in order to improve the traffic flow within the city of Nairobi. In most cases the Roundabouts and road interjections have some environmental improvements carried by the Nairobi City Council and in some cases by the private companies who in the recent past use some section of the roads and Roundabouts for their product advertisements.

The study undertaken recently involved a rapid assessment of the status of the Roundabouts and interjections in terms of vegetation cover and other social aspects that are likely to change during the proposed development.

This Section provides a floristic survey of the roundabouts and intersections studied in this assignment. It provides the names of the trees and suggestions of the impact on them during the construction and thereafter during the improvements.

5.2 Railway Station – Moi Avenue/Haile Selassie Roundabout

5.2.1 Trees Impacted

The two areas currently experience heavy traffic due to public transport vehicles that pick up passengers in the vicinity. The area around the railway station has some trees of the species *Tipuana tipu* (commonly known as the tipu tree or pride of Bolivia) On the Roundabout itself, flowers have been planted by the Nairobi City Council. The Moi/Haile Selassie Avenues' Roundabout has a few plants on the Moi Avenue side and mainly consists of old plantings of *Phoenix sp* and *Jacaranda mimiseafolia*.

5.2.2 Recommendation

Since the surrounding area has good environmental setting from the nearby Kenya Railway Headquarters compound and the August 7th Memorial Park, efforts must be made to plant suitable trees that match the existing standards. This will be an opportunity to upgrade both the road and the surrounding environment.

Considering that the *Jacaranda* and *Tipuana* species near the Roundabout are exhibiting conditions of stress probably from the automobile fumes, a suitable plant species should be considered for the site.

Individuals, the private sector and all other stakeholders should be encouraged to participate in keeping the new Roundabout and bus parks environmentally sound.

5.3 Global Cinema Roundabout

This is one of the largest Roundabouts in the city of Nairobi. The Roundabout enjoys the presence of the Nairobi River that flows right in the middle. The Roundabout has in the recent past attracted the attention of many environmental interests and hence the tree planting initiatives which are very conspicuous at the moment. Part of the Roundabout has also been turned into a public transport parking area where passengers are dropped and picked.

5.3.1 Vegetation Impacted

The vegetation found consists of several new plantings of both exotic ornamental trees and a few native species. The plant species include species such as *Zyzigium sp*, *Markhamia lutea*, *Kigelia sp*, *Tipuana tipu*, *Cassia spectabilis*, *Acacia xanthophloea*, *Croton megalocarpus*, *Eucalyptus sp*, *Acacia polyacantha* and *Phoenix reclinata*

5.3.2 Recommendation

That in the event of improvements being undertaken in the Roundabout, the designated area for public transport parking be developed and a ring of suitable trees planted around it to provide shade and act as a windbreak since the area is open and is prone to dust blowing from the nearby built up areas. The other side of the Roundabout (Nairobi River as boundary) should be planted with additional suitable trees and facilities e.g. resting benches, foot paths, a public toilet and litter bins be provided.

The commitments and pledges for the future improvement of the site from other stakeholders should continue even after new developments are finalized.

5.4 Pangani Roundabout

The Pangani Roundabout links traffic from town and the Thika – Kiambu Roads. The Roundabout has been rehabilitated in recent past. It has beautiful flowerbeds of the colourful *Acalypha* mixed with *Agave* and *Bougainvillea* species that have given the Roundabout a unique posture amongst the Roundabouts in Nairobi.



Figure 5.1 The Pangani Roundabout

5.4.1 Plant Species Impacted

The Plant species found on the Roundabout include:-*Cassia spectabilis*, *Terminalia mentalis*, *Bougainvillea sp*, *Agave sp*, *Borassus sp*.

5.4.2 Recommendation

The new spirit of Environmentally Friendly Roundabouts should continue. Even in case of alterations to the site, the corporate goodwill that is visible on the site should be encouraged and those who have adopted the Roundabout should be motivated to continue even after the intended improvement for a better traffic flow.

5.5 Muthaiga Roundabout

The Roundabout stands out unique with a structure indicating that the site had earlier been used to commemorate World Environment Day. The Roundabout now has numerous indigenous trees, and the improved environment within the Roundabout has made it possible for people to use it as a recreational park given that it is located away from the busy city centre.

5.5.1 Trees Impacted

This roundabout contains indigenous trees such as *Erithrina abyssinica*, *Markhamia lutea*, *Euphorbia tricali*, *Spathodea campanulata*, *Terminalia* and *Maesopsis eminii*. The urban ornamentel tree species include *Cassia spectabilis*, *Tipuana tipu*, *Agave sp*.

5.5.2 Recommendation

Any future improvement must not interfere with the visible initiatives already in place and which are being enjoyed by the pedestrians and other people living in the surrounding area.

5.6 Proposed Bus Park, Westlands/Waiyaki Way

The proposed development around Westlands Roundabout area will include relocation of the bus stage currently before the Roundabout. The proposed site for the stage is after the Roundabout along Waiyaki Way. The site has a number of big trees that may be affected during the development. Other activities include a small cafeteria, flowerbeds and a car wash business.

5.6.1 Trees Impacted

The trees at the proposed site for the bus stage include:- *Acrocarpus fraxinifolius*, several fully grown *Ficus benjamina*, *Spathodea companulata*, *Tipuana tipu* and *Bombay sp*

On the other side of Westlands Roundabout, towards the city center, the present bus park is also proposed to be relocated further down the road (Waiyaki Way). This vicinity also has a reasonable tree cover which will be affected. These include: *Spathodea campanulata*, *Jacaranda mimisifolia* *Phoenix reclinata* and *Cassia spectabilis*.

The area has also one big, unique fig tree that is estimated to be several years old. The fig, believed to be of the genus *Ficus* is a major landmark in the area and could be spared.



Figure 5.2 The Proposed Bus-Park/Stage in Westlands (Waiyaki Way)

5.6.2 Recommendation

That in the event of the Big trees being removed to pave way for the Bus Park/stage, efforts should be made to replace the trees with suitable species that will be relevant to the change of use. The involvement of the Department of Environment in the Nairobi City Council and Forest Department should facilitate choice of relevant tree species to be planted around the new facility based on existing by-laws.

The big fig, *Ficus* sp on the other side of the road towards the city centre and which is a landmark in the vicinity should be preserved for posterity. Any further removals should be replaced accordingly to suite the new planned developments in the area. Cooperate involvement should be enhanced to encourage the private sector around Westlands area to be involved in the maintenance of the streets, Roundabouts and bus parks.

5.7 Kenya National Library/Ngong Road Interjection

The site enjoys the good will of the Nairobi Hospital Insurance Fund, who has built a new multi-storey office facility in the vicinity. The National Health Insurance Fund (NHIF) has initiated tree planting activities around the facility and therefore makes the interjections appear like it is part of the funds facility.

5.7.1 Trees Impacted

The interjection has some new plantings *Phoenix* species of the *Palmae* family and a few other ornamental flowers.

5.7.2 Recommendation

In the event of road expansion, NHIF and the Kenya National Library should be incorporated in the new development discussions for future maintenance of the surrounding environment.

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