



**KATSINA STATE GOVERNMENT
NIGERIA EROSION AND WATERSHED MANAGEMENT
PROJECT (NEWMAP)**

DRAFT-FINAL REPORT

FOR:

**ENVIRONMENTAL SOCIAL MANAGMENT PLAN
(ESMP)**

**STORMWATER DRAINAGE REHABILITATION PROJECT FOR
MALUMFASHI TOWN IN KATSINA STATE, NIGERIA.**



February 2020

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STORMWATER DRAINAGE REHABILITATION PROJECT FOR MALUMFASHI TOWN IN KATSINA STATE

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State Project Management Unit
Katsina State Nigeria Erosion and Watershed Management Project
(KTS-NEWMAP)
No. 24C, Off Hassan Usman Road (WTC Road)
Katsina. Nigeria.

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ESMP PREPARERS

Dr. (Engr) Odili Ojukwu	Team Leader; Environmental, Social & Institutional Expertise
Mr. Nasiru Umar	Community & Social Specialist
Prof. Smart Uchegbu	QA/QC Specialist
Engr. Uche Umeokafor	Engineering and Geotechnical Specialist
Mr. Ali Samson	GIS Specialist
Ms. Adaeze Oba	Environmental and Social Specialist
Mr. Aminu Tukur	Geologist
Ms. Chinelo Umeokafor	Crop Scientist With Environmental & Social Expertise
Mr. Abdullahi Abdullahi	Water Engineering Specialist
Mr. Victor Chukwu	Agricultural & Biodiversity Specialist
Mr. ThankGod Oduehie	Agricultural & Social Specialist
Dr. Grace Ibeneme	Social Specialist
Mr. Stephen Olusanya	Project Engineer
Mrs. Nancy O'Nwachukwu	Bio-Remediation & Ecosystem Management Specialist
Ms. Ngozi Okoro	Social Specialist

CLIENT TEAM MEMBERS

Engr. Ashiru Mohammed	State Project Coordinator SPMU
Sanusi Muhamad	Environmental Safeguards Officer SPMU
Engr. Surajo Arzuka	Project Engineer SPMU
Aisha Mohammed	Social/Livelihood Officer SPMU
Salisu Dahiru	National Project Coordinator FPMU
Ajiboye Theresa	Environmental Safeguards Specialist FPMU
Ruth Peter Mshelia	Social/Livelihood Specialist FPMU

LIST OF ACRONYMS

ARAP	Abbreviated Resettlement Action Plan
CAI	Community Administrative Institutions
CBO	Community Based Organization
CIP	Community Involvement Program
EA	Environmental Assessment
E&S	Environmental and Social
ESHS	Environmental, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FBO	Faith-Based Organization
FGD	Focused Group Discussion
FGN	Federal Government of Nigeria
FME nV	Federal Ministry of Environment
FMKJ	Funtua, Malumfashi, Katsina and Jibia
FNGO	Focal Non-Governmental Organization
GBV	Gender-Based Violence
GEF	Global Environmental Fund
GIS	Geographic Information System
GRASS	Gully Rapid Action and Slope Stabilization
GPS	Global Positioning System
GRRM	Grievance Referral and Redress Mechanism
KTS-NEWMAP	Katsina State Nigeria Erosion and Watershed Management Program
KTSG	Katsina State Government of Nigeria
LGA	Local Government Area
MOE	Ministry of Environment
NEWMAP	Nigeria Erosion and Watershed Management Program
NGO	Non-governmental Organization
OP	Operation Procedure of the World Bank
OTG	OTG Enviroengineering Nigeria Limited
PAH	Project-Affected Household
PAP	Project-Affected Person
PC	Project Coordinator
PG	President General
PRS	Government's Poverty Reduction Strategy (PRS)
RAP	Resettlement Action Plan
SCCF	Special Climate Change Fund
SEA	Sexual Exploitation and Abuse

SMLS	State Ministry of Lands and Survey
SPMU	State Project Management Unit
ToR	Terms of Reference
UN	United Nations
WHO	World Health Organization
WB	World Bank

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EXECUTIVE SUMMARY

Background

The Nigeria Erosion and Watershed Management Project (NEWMAP), initiated by the Federal Government of Nigeria (FGN) and funded by the WorldBank (WB) and International Development Fund (IDF), is being implemented in Katsina State, and other participating states to help reduce flood and soil erosion vulnerability in the States and to develop the States' watersheds. Malumfashi town is one of the many towns and cities in Katsina State whose communities are perennially devastated by floods and soil erosion resulting from storm water flow. The flood and erosion hazards of these towns have caused major property losses to residents and remain a serious threat to lives in the communities. The stormwater drainage systems in Malumfashi have severely degraded over the years lacking adequacy and maintenance. These drainage systems have become corridors of most floods and erosion hazards in the town creating severe structural and environmental damages. The damages include destructions to homes, properties, and farmlands as well as causing unprecedented siltation of the community low lands.

The Katsina State NEWMAP is targeting to remedy and rehabilitate the Malumfashi Stormwater Drainage Corridors and reduce the impacts of the floods through the NEWMAP opportunity. This Environmental and Social Management Plan (ESMP) has been prepared in support of the proposed Malumfashi project in Katsina State.

Description of Project Activities

The location of the Malumfashi Project Site and the description of the target activities at site are shown in the following table.

Malumfashi Project General Descriptions

S/No	Project Area	Location Coordinates		Activity Description
		Easting	Nothing	
1	Malumfashi Town	N11° 47.283'	E007° 36.317'	Stormwater drainage reconstruction; Access roads, and watershed rehabilitation

The Malumfashi project consist of remedial structural and non-structural developments that include civil works and vegetative development. The proposed ground intervention will address, prevent and reverse land degradation for the long-term and will involve rehabilitation and reconstruction of the stormwater drainage area. The rehabilitation and reconstruction activities will involve civil works as well as bioengineering restoration and will result in disruptions in the physical environment, habitat, pests and cause inland river siltation as well as involuntary resettlement thereby triggering the relevant World Bank Safeguard Policies.

Rationale for the ESMP

The ESMP was designed to guard the process of the proposed intervention projects with a view to enhancing project benefits and introduce standards of good environmental practice for sustainable development in the State. This ESMP as a site-specific safeguard instrument is required to provide necessary procedures and criteria that will guide the proposed Malumfashi intervention in accordance with the World Bank Safeguard Policies and the Nigerian national environmental policies, guidelines and assessment procedures as well as those of Katsina State and the local agencies.

Objective for the ESMP

The objective of this study is to prepare an environmental and social impact assessment (ESMP) for the Malumfashi project that specifically identifies the potential impacts, evaluates and documents the set of mitigation, monitoring and institutional actions to be taken before and during site construction and rehabilitation to eliminate adverse environmental and social impacts, offset the impacts or reduce the impacts to acceptable levels. The potential impacts associated with the phases of the designed site interventions consisting of pre-construction, construction, and operation and maintenance (O&M) are developed and appropriate mitigation measures established for the impacts.

Policy, Legal and Administrative Framework

This ESMP is guided by the requirements of the World Bank safeguard policies and the relevant applicable state, national and international regulation, guidelines, conventions, industrial best management practices that are triggered by the NEWMAP. the project the potentially triggered WB safeguard operational policies (OPs) include:

- Environmental Assessment (OP/BP 4.01)
- Involuntary Resettlement (OP/BP 4.12)
- Cultural Physical Property (OP 4.11)

The basic legal framework for the regulation of the environment in Nigeria is braced in the Environmental Impact Assessment (EIA) Act No. 86 of 1992; the National Guidelines and Standards for Environmental Pollution Control in Nigeria (March 1991); the National Environmental Standards and Regulations Enforcement Agency (establishment) Act 2007 (NESREA), as well as the Land Use Act 1978 (modified in 1990). The power to regulate all environmental matters in Nigeria is vested in the Federal Ministry of Environment (FMEnv).

Existing Safeguard Instruments

The implementation of projects under NEWMAP is guided by two existing safeguard documents - the Environmental and Social Management Framework (ESMF) and the Resettlement Policy Framework (RPF) prepared for NEWMAP. The ESMF indicates that NEWMAP is categorized by the WB as a Category A project whose impacts are sensitive, diverse, unprecedented, felt beyond the immediate project environment and are potentially irreversible over the long term. For Malumfashi sub-project, the scale of the construction and development works will involve a significant disturbance of the environmental conditions, with both localized and regional impacts.

Biophysical Environment

The topography of the project area watershed shows a modest variation in elevation, with a maximum elevation change of 78.9m and an average elevation above sea level of 276.5m. The climatic condition of the project area is characterized by uniformly high temperatures and a short seasonal distribution of precipitations. The area falls within the Sahel savanna zone that receives about three months of rain and experiences up to nine months of dry season, which makes it very dry for most part of the year. The temperature in the area varies from 15°C to 42°C and is rarely below 14°C or above 44°C. The hot season in the area last for a little over two months from March to May, while the cool season lasts for about one and half months, usually from December to January of each year. The rainy season usually

lasts from June to September, with a peak that occurs in August. The dry season begins from September to June. Malumfashi watersheds experience extreme seasonal variation in humidity. The muggier period of the year last for over six months, from April to October.

Flora and fauna within and around the various project corridors and vicinity were surveyed and characterized to evaluate the health status of the vegetation and the general composition, diversity, and economic values, etc. of existing wildlife in each of the project areas. The project areas are urban communities that lie within the dry arid belt of northwestern Nigeria and evidences savannah type vegetation. The pressure on land for agriculture is largely diminished by the limitation imposed through the prevailing harsh climate and weather conditions within the Malumfashi project area for most part of the year. A listing of plant species with frequent or abundant distribution in the various categories for each project area are shown in Chapter 3.

Air quality assessment was carried out at several locations where active construction operations are anticipated and where human activities are expected to be high. The analytical results of the baseline air quality indicators within and around the Malumfashi project corridor show concentrations below the regulatory threshold limits. Field (in-situ) air sampling was carried out using the Dragner CMS Gas Analyzer. Ambient air was drawn into the calibrated equipment at the targeted locations and subsequently the digital readings for the various parameters were read off the instrument. The matrix of air sampling locations and coordinates across the project sites are included in Table 3.1. The parameters measured as part of the air quality assessment included carbon monoxide (CO), Ammonia (NH₃), hydrogen sulphide (H₂S), sulphur dioxide (SO₂), nitrogen oxides (NO_x), hydrogen cyanide (HCN) as well as oxygen (O₂). Analytical results obtained were reviewed against the appropriate regulatory limits to determine any potential health risk levels.

The surface and groundwater conditions at the Malumfashi site were assessed through laboratory analysis of parameters that affect the quality of water in the environment. Physical properties of water quality include temperature and turbidity. Chemical characteristics involve parameters such as pH and dissolved oxygen. Biological indicators of water quality include algae and phytoplankton. The analytical results of the baseline water quality indicators within and around the project areas show concentrations that are either below the regulatory threshold limits or are considered not significant.

Baseline soil parameters indicate the state of soil ecosystem characteristics, which especially reflect productive, buffering, filtering and other soil functions. Soil quality is significantly affected by physical, chemical, biological and biochemical properties sensitive to changes in the environment and land management. The analytical results of the baseline soil quality indicators show concentrations of key soil quality below the regulatory threshold limits.

Socio-Economic Characteristics

Based on the 2006 national population census records and the 3.04% annual population growth factor recommended by the national population commission (NPC), Malumfashi LGA of Katsina State have projected populations of 261,977 for 2018. Malumfashi districts are made up of essentially urban communities whose residents are generally business and agro-traders. Malumfashi communities have

average male/female population distribution at the household level of about 46%/54%;

The people of the Malumfashi project area are of the Hausa-Fulani ethnic group and generally, speak and write mainly the Arabic, Hausa/Fulani and English languages. Clanism and kinship are strong elements and driving forces in control of political and cultural institutions and service points. Residents of Malumfashi, communities are predominantly of the Islamic religion (Muslims).

Three major types of customary land tenure system exist in the project area, viz: – (1) individual land ownership; (2) family land ownership; and. (3) communal land ownership. Individual ownership may be for indigenes or for residents of the community. Family lands (as well as individual lands) are inherited from generational relatives. Communities retain family lands which may be sold and mostly used for developmental purposes. Based on field observations, over 45% of land within the project area is committed to agricultural production of food crops.

The literacy level within the project areas of Malumfashi communities is relatively moderate with 22.2% of the surveyed population of schooling age having never attended school. The moderate literacy level within the project affected area is reflected in the number of existing educational infrastructure support within the areas. There is a relatively high rate of unemployment (15.5%) in the Malumfashi communities. This situation potentially could pose some serious social risks when not properly managed. The community must come together to address unemployment as a social risk within its fold.

Solid wastes pose considerable hazards to human health due to the indiscriminate dumping of household wastes at illegal points or dumpsites. The continued and uncontrolled waste dumping in Malumfashi, communities cause regular obstructions to the storm water drainage systems. The common diseases in project area include diarrhea, malaria, typhoid, pneumonia, cough, skin diseases, deficiency diseases, eye diseases, ear diseases, and waterborne diseases resulting mainly from malnutrition and lack of hygiene. The quality of the health services in the area is generally poor with most residents patronizing quacks and medicine shops for their medical treatment. The socioeconomic infrastructures (roads system, electric power and access to water) in the area are also generally in fair to poor state. Public access to potable water is non-existent and power is generally not steady. Market facilities are fairly developed complimented by numerous home-based commercial shops located throughout the community.

Public Consultations and Concerns

The stakeholders' and public consultation methodology adopted in this study includes a qualitative and quantitative mixed method that offers an effective means to interact widely with the project area general public as well as stakeholder groups. Five broad categories of stakeholders were identified for this project based on the degree to which the project activities affected or involved such persons or group of persons. Individual stakeholders and project affected persons (PAPs) were also engaged during the ESMP preparation. To ensure that the rights and interests of PAPs are considered seriously local level consultative forums serve as community voices and become part of the entire project process.

The key environmental and social issues and concerns that were raised during the stakeholders'/community meetings include:

- 1) Community safety with the next cycle of the rainy season. The community was quite apprehensive of the intensities of the recurring floods and the continued advancement of soil erosion particularly in relation to safety risks posed to existing adjacent homes, human lives and farmlands;
- 2) Continued soil erosion and flooding in the area would lead to damages and loss of crops and livestock, personal possessions, spread of diseases such as typhoid, cholera, diarrhea, and malaria;
- 3) Loss of access to roadways, crop lands and pasture;
- 4) Physical displacement of vulnerable persons during project implementation. These issues and concerns raised were fully addressed during the community meetings. The specific mitigation measures are also included under the impacts mitigation measures of this ESMP.

Impacts of the Project

Potential Positive Impacts:

This project will effectively:

- Rehabilitate the degraded stormwater drainage corridors of Malumfashi;
- Control the perennial flooding and soil erosion within Malumfashi district communities;
- Improve the flow of traffic in and out of the communities;
- Reclaim useful land and expectedly will greatly appreciate the value of properties within the area as most erosion threatened properties have lost market value;
- Improved livelihoods for the area residents due to increase in agricultural productivity;
- Improved landscape vista of the project area
- Provide temporary job opportunities for both skilled and un-skilled labors

Potential Adverse Impacts

Disturbance of flora and fauna: Movement of personnel and vehicles may result in trampling of flora and disturbance of fauna.

Injuries and accidents: Workers may be exposed to injury from machines and equipment.

Loss of vegetation and impacts on flora and fauna: Rehabilitation work will involve clearing of vegetation in and around the canals and drains. This may result in a potential disturbance and/or loss of fauna at the project site.

Soil erosion and soil pollution: Excavation, vegetation clearance, leveling and other land preparation works will expose and loosen the soil making it susceptible to both wind and water erosion and subsequent loss of top soil. There is potential for compaction of soil from the use of heavy machinery and contamination of soil from fuels, oils and waste.

Air quality deterioration: Loose soils exposed during land preparation work and movement of vehicles/trucks (including haulage trucks) to and from the project site on the untarred surfaces may result in the increase of airborne particulates.

Vibration and noise nuisance: Movement and operation of machines/equipment, trucks during construction is likely to increase noise levels intermittently in communities; May also experience temporary increase in noise levels from construction activities.

Occupational accidents and risk of injury to workers: Workers' exposure to noise, dust and vibrations and risk of accidents and injury from the use of machinery

and equipment, materials management at the construction yards/workplace are concerns that need to be addressed.

Risk of accidents and injury to the public: The movement of trucks and other vehicles and machinery to and from offsite sources to the project site will pose safety risks for the communities along and around the project site. Communities near the project site may also be at risk from unsecured excavations.

Influx of workers and migrants: Migrants who move into the project area for job opportunities may not conform to the societal norms and cultural practices and may upset the social structure of these communities.

Obstruction of access ways to communities: Construction works at the project site may render portions of access roads and existing foot paths inaccessible to users and/or temporarily closed. This may create inconvenience and increase travel time to and from the affected communities.

Risk of spread of diseases: Poorly managed construction sites, site camps, indiscriminate disposal of waste and open defecation will create unsightly conditions and may result in the spread of disease (e.g. malaria, typhoid).

HIV/AIDS and STIs Risks: Construction workers camp give rise to health risks associated with poor sexual practices and prostitution.

Analysis of Project Options and Alternatives

Consideration of alternatives related principally to ways of improving the proposed intervention activities and/or attempting to avoid or minimize potential significant negative impacts. Different alternatives were evaluated consistent with the various components of the Malumfashi projects intervention. For the proposed project, the alternatives considered include: delayed project alternative; a do-nothing alternative; and the planned project alternative. The selection of the planned project alternative was premised on several considerations, including the desirability/acceptability of the project, the government's position or inclinations to the project, the potential environmental and social impacts of the project, the economic viability of the project and impact to human life.

Identified Significant Adverse Impacts and Mitigation Measures

The designed measures to mitigate identified significant adverse impacts are included in the table below:

Summary of Impacts and Mitigation Measures

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
PRE CONSTRUCTION				
1	<p><u>Impacts on Community and PAP Management (Loss of physical assets; Loss of means of livelihood)</u></p> <ul style="list-style-type: none"> • Croplands and economic trees along the gully setback may be destroyed during gully wall stabilization. • Construction activities may affect persons with critical health conditions, including old persons, children and other vulnerable persons within project area may be temporarily relocated for construction phase. 	<p>Grassland; Shrubs; Crop fields and pastures; Residential homes</p>	<ul style="list-style-type: none"> • A stand-alone Resettlement Action Plan (RAP) has been prepared for the project addressing impacts on the community and the PAP management. The SPMU shall be required to implement the RAP in accordance with the provisions therein • Appropriate compensations shall be paid for project acquired lands; temporary use of lands; destroyed crops and economic trees. • Compensation to persons (PAPs) within project area who will need to be temporarily relocated prior to beginning of construction activities. 	<p>SPMU-ESO; Focal NGO SMEnv.; SMLS.; Community Leaders; Site Committee</p>

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
	<ul style="list-style-type: none"> Possible disagreement over siting of staging areas and temporary facilities between community and contractor 		<ul style="list-style-type: none"> Create awareness among community members and sensitize the people to all project activities Seek the consent of the landowner to erect the site office for the specified duration of the project; 	
2	<p><u>Public/Stakeholders Participation</u></p> <ul style="list-style-type: none"> Non-involvement of project community and stakeholders affects the project post-construction maintenance and sustainability 	Community members	<ul style="list-style-type: none"> Build capacities within community Incorporate community feedback into project implementation process Disseminate project study findings; Ensure that period of inaccessibility to land is as short as possible Awareness campaigns and capacity building. The Contractor shall be required to prepare and submit a Stakeholders' Engagement Plan to the SPMU for approval and adoption for the contractor's implementation 	SPMU-ESO; Focal NGO; SMOW; SMeNv; SMOH; Community Leaders; Site Committee
3	<p><u>Vegetation and Biomass Removal Management</u></p> <ul style="list-style-type: none"> Damage to the natural and planted vegetation on acquired gully setback lands during site clearance, areas for siting of temporary office and workers camp. Impact on flora and fauna. Impact on wild life. 	Grassland; Shrubs; Crop fields and pastures;	<ul style="list-style-type: none"> Mark out areas for clearance & where possible use manual method of vegetation clearing; Undertake selective clearance by removing tall woody species leaving saplings for quick regeneration of vegetation; Prevent colonization by invasive species- Prevent damage to critical ecosystems and habitats Prevent destruction of flora and fauna. The Contractor shall be required to prepare and submit a Vegetation and Biomass Management Plan to the SPMU for approval and adoption for the contractor's implementation 	SPMU-ESO; Focal NGO; SMOW; SMeNv; SMOH; Community Leaders; Site Committee
4	<p><u>Gender Based Violence/Sexual Exploitation & Abuse Management</u></p>	Construction workers; Community members.	<ul style="list-style-type: none"> Contractor to submit an ESHS Performance Security to PMU Contractor to prepare and submit a GBV/SEA Management Plan to PMU for approval and adoption for the contractor's implementation 	Contractor SPMU
CONSTRUCTION PHASE				
5	<p><u>Dust and Air Quality Management</u></p> <ul style="list-style-type: none"> Air pollution is expected from dust and emissions from construction vehicles, plant and equipment. Dust is generated by excavation and earth moving operations and causes nuisance to residents and other sensitive receptors. Exhaust emissions occur from poor maintenance of plant and equipment or over revving of engines. 	Construction workers; Vulnerable persons; Community members; Residential homes;	<ul style="list-style-type: none"> Dust generation will be controlled mainly by the use of water, especially in the dry season. Use of water tanker for purposes of water dousing to control dust emission. Erection of speed control signals and ramps mounted in communities; Covering of hauling trucks carrying sand and other aggregates; Covering of heaped material e.g. sand will be covered; Use of nose masks by all workers at road maintenance/works sites. Surfaces of vegetation along the 	SPMU-ESO; Focal NGO SMOH.; Community Leaders; Site Committee

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
			<p>maintenance road will be monitored to verify the effectiveness of dust suppression method.</p> <ul style="list-style-type: none"> The Contractor shall be required to prepare and submit an Air Quality Management Plan to the SPMU for approval and adoption for the contractor's implementation. 	
6	<p><u>Water Resources, Erosion and Sedimentation, Run-off Control Management</u></p> <ul style="list-style-type: none"> Increased sedimentation and runoff may result from activities during the construction works. Earthworks release suspended particles into watercourses, which can have temporary detrimental effects on water organisms. Spillages of fuel and other petroleum products cause contamination of the soil and water resources. Excavation at the borrow pits may cause land degradation in the vicinity of the borrow pits; may cause soil erosion and siltation of nearby roads. 	<p>Streams; Ponds; Groundwater; Drainage corridors; Roadways.</p>	<ul style="list-style-type: none"> Location for heaping construction material (e.g. sand and other aggregates) not less than 50m from water bodies and drainage channels (i.e. a separation distance of 50m will be observed); Site for fueling of machinery and servicing of equipment will be located at a minimum distance of 100m from water bodies, wetlands and drainage channels; Embankment erection around fueling and other liquid or spill-able storage sites in order to limit or contain such material from escape to potentially pollute water resources; Side drains (where appropriate) will be provided with settling basins near water bodies to remove silt and debris from road surface and construction site run-off, before discharge to adjoining streams or rivers; Adequate side drains provided to carry run-off into drainage channels to prevent erosion; Culverts of suitable capacity constructed to contain and direct flow, especially at peak flow and run-off; Road maintenance works to be carried out off peak rainy season; Provision of toilets and urinal at locations not less than 50m away from water bodies; and Adequate worker awareness on sanitation and measures to avoid water resource contamination. The Contractor shall be required to prepare and submit a Water management Plan and an Erosion and Sedimentation Management Plan to the SPMU for approval and adoption for the contractor's implementation. 	<p>SPMU-ESO; Focal NGO; SMOW; Community Leaders; Site Committee</p>
7	<p><u>Noise and Vibration Exposure Management</u></p> <ul style="list-style-type: none"> Noise will emanate from moving vehicles, excavators, generators, power tools (e.g. for vegetation clearing), and compressors during construction. Vibrations may come from soil compaction 	<p>Construction workers; Vulnerable persons; Community members; Residential homes;</p>	<ul style="list-style-type: none"> Equipment servicing plan will be prepared and strictly followed to ensure efficient machinery performance and optimum noise generation. Stationary equipment shall be sited at safe distances from sensitive areas to minimize noise impacts Workers operating noisy equipment will not be exposed continuously for more than 3 hours 	<p>SPMU-ESO; Focal NGO; SMOW; SMOH; Community Leaders; Site Committee</p>

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
	equipment and other vibroequipment to be used at the gully heads.		a day. <ul style="list-style-type: none"> • Workers will be provided with ear plugs. • Workers handling vibrating equipment or parts will be given pads to absorb the vibrations and will not be exposed continuously for longer than 3 hours a day. • Sanctions (ranging from a warning to dismissal) will be instituted by the contractor against workers who do not observe the use of appropriate PPEs 	
8	<p><u>Occupational/Public Health and Safety Management</u></p> <ul style="list-style-type: none"> • Occupational accident during construction. • Construction operations pose hazards to people living or working near construction areas or employed to work on site. Excavations, construction traffic and stockpiled materials pose particular threats to children and livestock. Children may be inadvertently recruited to work on construction sites. 	Construction workers; Vulnerable persons; Community members; Residential homes;	<ul style="list-style-type: none"> • Health, safety and environmental training and awareness will be extended to community members and local residents; • Erection of warning signals and use of reflective tapes at approaches to excavations, heaped materials, stationary equipment, etc. • Posting of speed limits of 40km/hr at approaches to construction sites; • Safety meetings held twice a week and documented accordingly; • Inductions and awareness programmes held for all employees on occupational health and safety practices; • A First Aid team formed to provide first aid services to workers and where appropriate make referrals to the nearest Health Centre or hospital; • First Aid team to be trained by a medical team from the Health Centre; • Accident records at construction site and neighbourhoods to be maintained both for workers and the public; • Stocks of PPEs to be maintained and supplied to workers regularly as needed; and • Workers required to wear the appropriate PPEs e.g. helmets, ear plugs, nose masks, vibration pads, hand gloves, etc. • The Contractor shall be required to prepare and submit a Community/Occupational Health Management Plan to the SPMU for approval and adoption for the contractor's implementation 	SPMU-ESO; Focal NGO; SMOH; Community Leaders; Site Committee;
9	<p><u>Gender Based Violence /Sexual Exploitation and Abuse (GBV-SEA) Management</u></p>	Construction workers; Vulnerable persons; Community members; Residential homes;	<ul style="list-style-type: none"> • Inductions and awareness programmes held for all employees on GBV-SEA issues; • Contractor to comply with ESHS provisions of the contract. • GBV-SEA awareness will be extended to Nodu and Umudocha community members and local residents; • GBV-SEA records at construction 	Focal NGO; SPMU-ESO; SMOH; SMOH; Community Leaders; Site Committee

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
			<p>site and neighbourhoods to be maintained both for workers and the public;</p> <ul style="list-style-type: none"> Workers required to report any GBV-SEA issues to the construction management. The Contractor to prepare and submit a GBV-SEA Management Plan to the SPMU for approval and adoption for the contractor's implementation 	
10	<p><u>HIV/AIDS and STIs Management</u></p> <ul style="list-style-type: none"> Construction workers camp give rise to health risks associated with poor sexual practices and prostitution. 	<p>Construction workers; Vulnerable persons; Community members; Residential homes;</p>	<ul style="list-style-type: none"> Provide quarterly HIV/AIDS and STIs awareness programmes for workers and nearby communities; Health and HIV awareness team arranged from the State Health Ministry for the quarterly programmes; Sponsored educational package put together by the team to be implemented to enlighten both workers and communities; Training of peer educators within the work force and in communities by the team; and The contractor to provide free condom supplies and encourage free discussions, counselling and testing. 	<p>Focal NGO; SPMU-ESO; SMEnv; SMOH; Community Leaders; Site Committee;</p>
11	<p><u>Construction Operation and Slope Stabilization</u></p> <ul style="list-style-type: none"> Construction operations will result in topographic alterations. Construction operations may result in landslides, rock cave-ins, and mudflow/flooding. Construction operations can pose earth movement hazards to people working near the construction areas due to unstable soil profiles from site excavations. 	<p>Vulnerable persons; Community members; Residential homes;</p>	<ul style="list-style-type: none"> Maximize local employment (including women) on construction works (this should be a contractual requirement to hire a percentage of local workforce including women) Provide occupational health and safety awareness training and workshops, Use of child labor shall be strictly prohibited Monitor and maintain intervention work for continued stability and quality Shortcomings in the control structures including the check dams (retention basins) along the gully corridor should be corrected before they develop into serious problems. The Contractor shall be required to prepare and submit an ESMP and Emergency Response and Incident Plan to the SPMU for approval and adoption for the contractor's implementation 	<p>SPMU-ESO; Focal NGO; SMOW; SMEnv; Community Leaders; Site Committee</p>
12	<p><u>Traffic and Transportation Hazards</u></p> <p>Impedance to traffic flow and movements. Possible vehicular collisions and accidents. Temporary diversions of traffic.</p>	<p>Construction workers; Community members; Residential homes;</p>	<ul style="list-style-type: none"> Traffic wardens to be posted at positions 100m from the construction points on either side of the road to ensure orderly traffic flow; Actual working areas to be secured with barricades; Adequate road warning signs to be posted at vantage points to warn and direct traffic; Traffic and transport associated 	<p>SPMU-ESO; Focal NGO; SMOW; SMEnv; Community Leaders; Site Committee</p>

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
			<p>with project will adhere to existing roads or follow specified routes as established.</p> <ul style="list-style-type: none"> The Contractor shall be required to prepare and submit a Traffic and Vehicle Management Plan to the SPMU for approval and adoption for the contractor's implementation 	
OPERATIONS PHASE (POST CONSTRUCTION)				
13	<p><u>Waste Management (solid and liquid wastes)</u></p> <p>Proposed project will generate waste during construction including off specification materials such as wood, plastic, paper and domestic waste from construction areas and worker camps. This could result in increased pressure on local waste dump facilities as well as potential for unauthorized disposal and littering if not properly managed.</p> <ul style="list-style-type: none"> Waste bins to be provided for the disposal of waste generated; Waste will be segregated into three at source - organic (food residues), recyclables (woods, metals) and non-recyclables (plastic and glass wastes); Organic waste to be composted near the site office to enrich the soil, while plastics and glass are taken to the district dump-sites; 	Streams; Ponds; Groundwater; Drainage corridors; Roadways.	<ul style="list-style-type: none"> Topsoil removed from the right of way for maintenance work to be spread on the land to avoid disrupting drainage network; and Toilets and urinals to be sited at least 100m from any stream or drainage channel and decommissioned at the end of project. The Contractor shall be required to prepare and submit a Waste Management Plan to the SPMU for approval and adoption for the contractor's implementation 	SPMU-ESO; Focal NGO; SMOW; SMEnv; Community Leaders; Site Committee
14	<p><u>Land use restriction</u></p> <p>Use of the acquired land associated with gully setback will be altered and restricted to limited community uses. Structures may never be erected on this portion of land but economic trees could be planted.</p> <ul style="list-style-type: none"> Create awareness among community members; Build capacities within community; Incorporate community feedback mechanism into process 	Community members; Residential homes;	<ul style="list-style-type: none"> Ensure periodic monitoring of restricted areas Continuous maintenance of erosion control structures including concrete channels and check dams, and bio-remediated areas for continued effectiveness. 	SPMU-ESO; SMEnv; Focal NGO; Community Leaders; Site Committee
15	<p><u>Closure of temporary office, staging areas and decommissioning of project</u></p> <p>Damage to land forms and</p>	Community members; Residential homes;	<ul style="list-style-type: none"> Enforce agreed measures to render the site safe and usable post construction to the satisfaction of the community and landowners. 	SPMU-ESO; Focal NGO; Community Leaders; Site Committee

Item No.	Impacts	Receptor(s)	Proposed Mitigation Measures	Responsibility Party
	vegetation <ul style="list-style-type: none"> • Ensure that agreements with the community and landowners on post construction hand-over are kept. 			
16	<u>Erosion control system failure management</u> <ul style="list-style-type: none"> • Check dams that are not properly constructed may suffer damage that could reduce the structural integrity of the erosion control structures during post-construction phase. • Structures built in the channelization for stabilization purposes should be observed for damage especially during rainy seasons and after heavy storms. Any damage observed should be repaired immediately to avoid further damage and the eventual collapse. 	Community members;	<ul style="list-style-type: none"> • Ensure periodic monitoring of erosion control structures • Continuous maintenance of erosion control structures including concrete channels and check dams, and bio-remediated areas for continued effectiveness. 	Community Leaders; Site Committee CBOs/CDOs

Some of the occupational health issues/Hazards and mitigation measures

S/N	occupational health and safety issues	Mitigation Measures	Responsible party
1	The exclusion of occupational health and safety issues in contract documents	Occupational health issues shall be noted and included in contract documents to make them obligatory/mandatory.	SPMU FPMU Contractor
2	Use of defective, damaged or inappropriate tools for a particular and specific task.	Provide workers the appropriate and quality hand tools as are necessary for the execution of specific activities or tasks.	SPMU Contractor
3	Engagement of workers to use machines and tools for which they have not been trained.	Provide on-the-job training to workers on how to handle and use available tools and machinery before engaging them.	SPMU Contractor
4	Involvement of workers in activities without the provision of the appropriate protective wear.	Appropriate protective wear to workers for specific activities/tasks. (Gumboots, gloves, overalls, helmets, etc.)	SPMU Contractor
5	Non provision of First Aid Kits (FAKs),	FAKs and trained personnel in administering first-aid must always be available on the site for purposes of minor injuries.	SPMU Contractor
6	The exposure of workers to dust during implementation of works.	Workers must wear the right protective gear. Watering of dusty areas must be done with a water at least three times a day to reduce dust levels to the barest minimum.	SPMU Contractor

7	Lack of informatory signposts indicating that work is in progress.	During execution of work especially at a site open to traffic, informatory signposts must be posted so as to lessen the risks of accidents to workers.	SPMU Contractor
8	Accidents involving plants/equipment	Only properly trained men for operation.	Contractor
9	Safety of and from traffic	Providing adequate traffic signs and protection at locations where works are taking place. Where necessary, traffic should be stopped during the placement or removal of temporary signs.	SPMU Contractor

ESMP Implementation and Management

The primary responsibility for the project execution and ESMP implementation is on the SPMU. The SPMU through its various officers, and may also employ the services of consultants and contractors, shall provide the necessary awareness, mobilization and facilitation, project appraisal, approval & disbursement, capacity building, monitoring & evaluation of all project activities and reporting to the FPMU and the World Bank.

The key actors in the implementation of this ESMP include:

- The contractor - to be awarded the rehabilitation contract and be required to implement the environmental and social safeguard measures;
- SPMU - to ensure that environmental and social (E&S) safeguards and other mitigation measures are duly implemented;
- FMEEnv/FPMU - to ensure compliance with the ESMP and other relevant approval conditions;
- SMEEnv - to oversee the effective implementation of the flood control project and related E&S safeguards
- PCC - to address complaints of any aggrieved parties on E&S safeguards
- SMLS – to ensure appropriate disposition of land matters in accordance with the statutory requirements.

Environmental and Social Monitoring Plan

Monitoring programmes have been developed for all significant adverse environmental and social impacts identified. In addition to the significant adverse impacts, monitoring plans have been developed for air quality, noise, public complaints/grievances, and environmental compliance.

Provisional Environmental and Social Management Plan

The programmes proposed to meet the mitigation measures and monitoring programmes will include the following:

- Adoption of Environmental, Health and Safety Policies and Operational Procedures;
- Environmental, health, safety and security management structuring;
- Environmental, health, safety and security committee;
- Environmental and social monitoring programmes;
- Audits and reviews;

- Public participation;
- Grievance redress mechanism; and
- Environmental and social management budgeting

Budget and Schedule of Work

The budget estimate for the E&S safeguards as determined under this ESMP, including cost for administration, monitoring and evaluation is ~~N~~**28,140,000.00** (Twenty Eight Million One Hundred and Forty Thousand Naira) only. The proposed budget will facilitate the implementation of the various ESMP management, monitoring plan and capacity building measures to be executed by the SPMU and should be made an integral part of financing for the Malumfashi intervention and development project. The specific E&S safeguards obligations for the contractor should be incorporated into the contract specifications along with other contract provisions.

The estimated mitigation cost for the environmental and social management Plan has been developed with due consideration in the three project phases (pre-construction, construction and post-construction) to the following factors:

- The magnitude of the flood control problem;
- The type of technology to be employed;
- The volume of the project affected households and persons; and,
- The area of coverage of the proposed project.

Disclosures

This ESMP will be to public review and it should be disclosed in the state to the general public for review and comment at designated locations in Katsina State and in World Bank Information Website. Display centers will include Katsina NEWMAP SPMU office, NEWMAP FPMU office, EA Department of FMEnv., Office of State Commissioner for Environment, LGA NEWMAP Liaison office, Project Community, and Office of the State Commissioner for Local Government matters.

Contractor Responsibility for Implementation of ESMP

The Contractor shall be responsible for implementing all impact mitigation measures as detailed in the ESMP provisions of the ESMP Report for the project. Prospective Construction Contractors are therefore required to competitively bid for the implementation of the Impact Mitigation Measures. The Mitigation Measures are contained in Tables 6.1 of this ESMP Report.

Bidding Contractors are also required to include as part of their costs all elements associated with (i) ESMP Management, (ii) Mitigation Monitoring, and (iii) Capacity Building & Trainings as provided in Table 6.9 of this ESMP Report. This shall be a one line item in the BEME to ensure adequate budget.

Bidding Contractors are further required to provide Environmental, Social, Health and Safety (ESHS) Performance Guarantee to the tune of the SPMU-specified sum or percentage of the project cost in accordance with the new World Bank ESHS requirement.

For purposes of clarity, ALL BIDDING CONTRACTORS shall obtain as part of the bidding process a full copy of the ESMP Report prepared for this project to fully understand the scope of the ESMP implementation and required mitigation actions.

In the event that the ESMP Report is not provided, the contractor shall request for it from the SPMU as part of the bidding process requirements.

Contractor’s Environmental and Social Management Plan (C-ESMP)

The contractor is required to provide a C-ESMP to guide its operation during the project implementation – the provision of the project ESMP notwithstanding. This management plan is expected to address all that the contractor plans to do at different phases following the prepared ESMP.

CHAPTER 1: INTRODUCTION

1.1 Background

The Government of Nigeria is implementing the multi-sectoral Nigeria Erosion and Watershed Management Project (NEWMAP), which is financed by World Bank (WB), Global Environment Facility (GEF), the Special Climate Change Fund (SCCF), and the Federal Government of Nigeria (FGN). NEWMAP was initiated by the FGN and is currently being implemented in 20 states, namely Anambra, Abia, Cross River, Edo, Enugu, Ebonyi, Imo, Delta, Sokoto, Akwa Ibom, Gombe, Plateau, Kogi, Kano, Ondo, Oyo, **Katsina**, Borno, Niger, and Nasarawa States. The project is designed to support participating States in reducing vulnerability to flood and erosion and to develop the states' watershed. Katsina State is located in the Northwest geopolitical zone of Nigeria.

The development objective of NEWMAP is to rehabilitate degraded lands and reduce long-term flood and erosion vulnerability in target areas. In Katsina State, NEWMAP activities involve medium-sized civil works such as construction of infrastructure and/or stabilization or rehabilitation of existing degraded stormwater drainage systems and flood plains as well as small works in the small watershed where erosion gullies develop and expand. The lead agency at the FGN level is the Federal Ministry of Environment (FMEnv.), Department of Erosion, Flood and Coastal Zone Management. The Katsina State Ministry of Environment through the State Project Management Unit (SPMU) is responsible for the implementation of NEWMAP activities at the State level.

The location coordinates of Nigeria are latitude 9°4'55.2"N and longitude 8°40'31"E. Katsina State is located in the Northwest geopolitical zone of Nigeria and takes the shape of a mushroom extending longitudinally from 7°03'E to 9°05'E in the northern part and from 6°52'E to 7°52'E in the southern part of the state. The State stretches between approximately latitude 11°10'N and 13°22'N. The State was carved out of old Kaduna State in 1987 and is bounded to the East by Kano State, to the West by Zamfara State, in the South by Kaduna State and in the North by the Niger Republic. The capital city of Katsina State is Katsina Town.

Malumfashi town is one of the many towns and cities in Katsina State whose communities are perennially devastated by floods and soil erosion resulting from storm water flow. The flood and erosion hazards of these towns have caused major property losses to residents and remain a serious threat to lives in the communities. The stormwater drainage systems in Malumfashi have severely degraded over the years lacking adequacy and maintenance. These drainage systems have become corridors of most floods and erosion hazards in the town creating severe structural and environmental damages to the communities and causing destruction to homes, properties, and farmlands as well as causing unprecedented siltation of the community stream and low lands.

Along these degraded stormwater drainage corridors, several key access roadways have been either completely washed away or cut through making the roads unusable and vehicular movements very difficult or halted. It is anticipated that the damaging impacts of the floods and erosion resulting from the degraded stormwater drainages within and outside the various communities will increasingly be more devastating to the residents with each cycle of the rainy season. Urgent intervention is therefore

needed at the towns to salvage the environment, save lives, property and infrastructure and to restore the people’s confidence in Government. In an effort to redress the impacts of flooding and erosion within and around the towns of Malumfashi, the Katsina State Government (KTSG) has targeted to rehabilitate and reconstruct the various stormwater drainage systems through the NEWMAP opportunity. Figure 1.1 is the map of Nigeria showing the location of Katsina State while Fig. 1.2 shows Katsina State showing the Local Government Areas (LGAs) and the project locations.



Fig. 1.1: Map of Nigeria Showing Location of Katsina State



Fig. 1.2: Map of Katsina State Showing LGAs and Project Locations
(Source: Von.gov.ng)

1.2 Description of Proposed Intervention Areas

The project goal is to design and develop effective stormwater drainage systems for Malumfashi, town with proper channelization to appropriately convey stormwater from within them to safe locations at their outskirts. The safely discharged water is expected to flow into nearby natural rivers/streams.

1.2.1 Project Area and Terrain Features:

A general description of the project activities for Malumfashi is given in Table 1.1. The location coordinates of the town are also shown in the Table. The satellite

imageries showing the general locations of the Malumfashi project areas are shown in Figures 1.3.

Table 1.1 Malumfashi Projects - Activity Descriptions

S/No	Project Area	Location Coordinates		Activity Description
		Easting	Nothing	
1	Malumfashi Town	N11° 47.283'	E007° 36.317'	Stormwater drainage reconstruction; Access roads, and watershed rehabilitation

Source: Consultant Field Data (July 2019)

1.2.1.1 Malumfashi Stormwater Drainage Terrain Features:

The project site is between Unguwar Jabbo, Rivers Zuzzurfa, Asha-da-Lafiya and Hinache to Gangarawa drain system within the Malumfashi township in Malumfashi Local Government Area of Katsina State. It is approximately located between latitudes 11° 46.009' and 11° 48.482'N and between longitudes 7° 35.794' and 7° 38.794'E. It is located on an expansive northern plain known as the high plains of Hausa Land. These plains are underlain by basement complex rocks of cretaceous age. The topography slopes gently in the north-eastwards direction giving direction to the town's storm water flow. It is within the tropical continental region of the state where rainfall is high. The town is fragmented by the numerous streams that cross the town from south-east to the north-west. The ravaging effect of these streams in full flood is one of the problems faced by the inhabitants of the town. (Enplan Group, 2018)

Malumfashi experiences incessant flooding due to heavy rainfall in the catchment area. On one hand is River Zuzzurfa that flows northwards through the town, and on the other is River Asha-da-Lafiya that flows westwards from the eastern outskirts traversing the town. These are the two major natural drains that were joined by tributaries of various order traversing the town to join the famous Hinache River west of the town. The effect of these seasonal rivers is highly felt at the peak of the rainy season when the whole of the Gangarawa and other parts of town is flooded. The likely cause of this flood is the hydraulic geometry of the river channel and the increased discharge downstream but mainly due to the velocity of the river discharge and the inadequate outlets at the Funtua-Yashe road. Thousands of hectares of agricultural land were washed off, while the runoff with its sediment load flows into the town, rendering the existing watercourses incapable to accommodate the fast moving water.

The proposed Malumfashi drainage works are approximately 7.85km in total length and involves a total of eight drains. Figure 1.3 shows the satellite view of the Malumfashi project area.

1.2.2 General Field Observations

From the Malumfashi field visits, the following factors were identified as generally being responsible for the flooding menace in the area:

- Prolonged and intense rainfall;
- Disposal of wastes by the people into open drains and the blockage of culverts and drainage channels by these wastes;
- Growth of vegetation in channels;

- Encroachment of physical structures such as houses, schools, religious centres, and commercial enterprises into setbacks of rivers/streams;
- Increased urbanization resulting in increased surface areas of impervious surfaces that produce runoff exceeding the capacity of the hydraulic structures.
- Blockage of bridges, culverts and drainage channels due to high sediment yield from construction activities and several earth roads;
- Transformation and sand-filling of areas that were initially floodplains for residential, commercial, and religious land use.

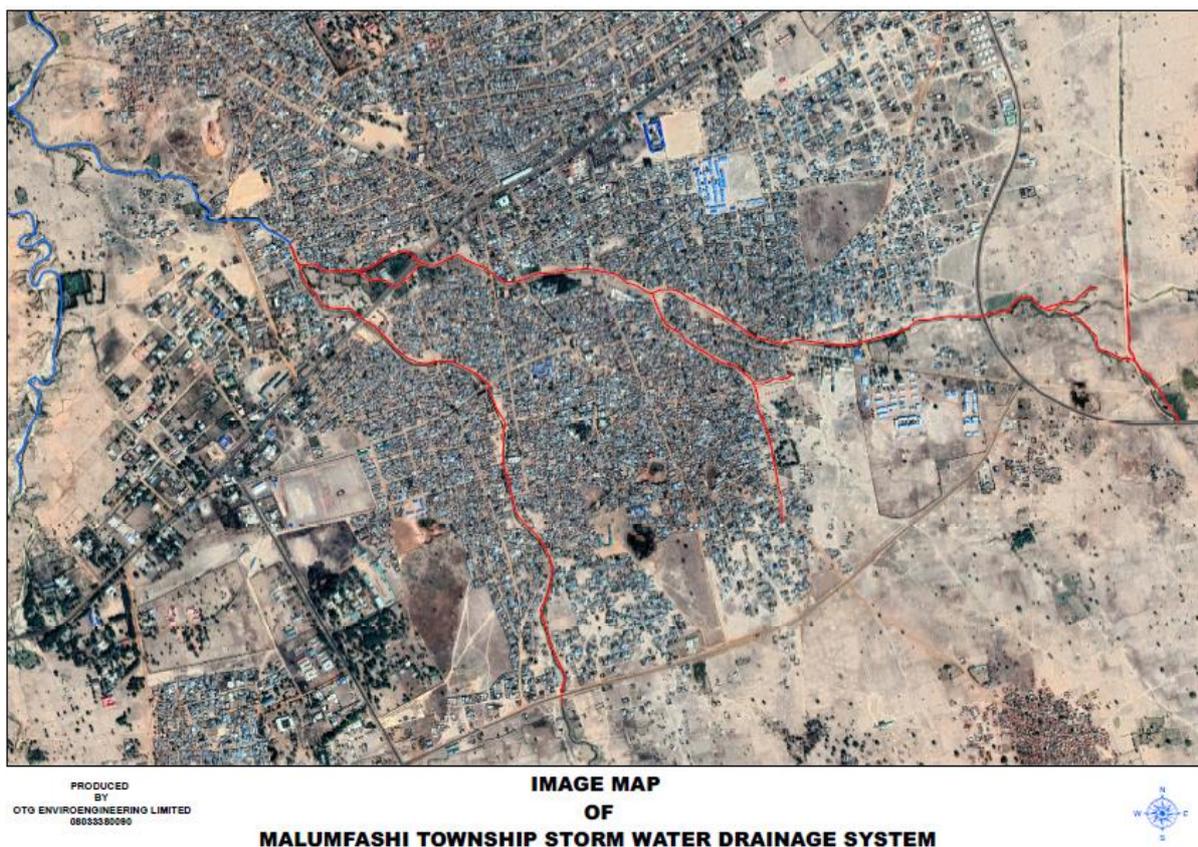


Fig. 1.4: General Satellite View of Malumfashi Stormwater Drainage Corridors
(Source: OTG Graphic Designs)

1.3 Project Rationale:

Malumfashi, Townare some major towns in Katsina State which experience incessant flooding due to heavy rainfall in the communities. The flood and erosion hazards within these towns have caused loss of properties to the residents and continue to pose serious threats to lives and properties to community members. Many community members have also lost their homes, lands and properties to the devastating floods and erosive actions of stormwater.

It is highly envisaged that the damaging impacts of stormwater and floods will increasingly be more devastating with each passing raining season and as the density of settlements increase in the catchment area. There is a perpetual palpable fear of losing lives particularly children, to the floods among the residents of the area while economic activities are often disrupted with increased cost of movements. Involuntary resettlement can cause loss of income, assets, and community ties that,

especially among the poor, can be essential for survival and well being. In extreme cases, involuntary resettlement can lead to the dissolution of families, impoverishment and health problems. Urgent intervention is therefore needed at the stormwater drainage corridors for the environment of these towns to be salvaged, save lives, property and government infrastructure and to restore the people's confidence in Government.

1.4 Project Description:

Based on the engineering design concepts developed by ENPLAN Group for the project sites, the proposed erosion control measures include the main structures for the Drainage bed system and the bank stabilization measures. The designed Drainage bed system comprise the following structures:

- Drain Inlet Structure;
- Lined canal for the total length;
- Chute structure with stilling basins;
- Drop structures; and,
- Exit system/outlet structure

The designed bank stabilization measures include:

- Gabion retaining wall;
- Slope cutting with geo-textile and grass; and,
- Bio-remediation grass planting.

1.4.1 Malumfashi Stormwater Drainage Intervention:

The proposed Malumfashi drainage works are approximately 7.85km in total length and involves a total of eight drains. Malumfashi town is one of the major towns in the State that also have flooding issues during the rainy season, mainly due to severely degraded and non-effective storm water drainage systems. Table 1.3 shows the design dimensions of the proposed Malumfashi drainage works.

Table 1.2: Dimensions of the Proposed Malumfashi Drainage Works

Name	Description	Length (km)	Maximum Depth (m)	Channel Bed Width (m)	Top Channel Width (m)
Drain 1	Minor	0.50	0.840	2.25	4.770
Drain 2	Major	3.30	1.249	6.00	9.747
Drain 3	Minor	0.25	0.110	2.25	2.580
Drain 4	Minor	1.00	0.763	2.25	4.539
Drain 5	Minor	0.20	0.100	2.25	2.550
Drain 6	Minor	2.10	1.092	2.25	5.526
Drain 7	Minor	0.30	0.100	2.25	2.550
Drain 7	Minor	0.20	0.100	2.25	2.550
TOTAL		7.85			

Source: Enplan Group Engineering Design Report (Nov. 2018)

Based on the engineering designs of the Malumfashi project, the principal features of the above remedial measures to be undertaken as part of stormwater drainage intervention include:

- 1) The construction of concrete and Reno-mattress drainage canals, Drainage bank protection works using stone pitching and grass, provision of toe protection, provision of box culverts, energy dissipaters, stilling basin for the main drainage corridors.
- 2) Stabilization of the existing components of the stormwater drainage using reinforced concrete canals, bio-remediation using grass;

Civil Construction Works:

- The key activities in putting up the civil works include:
 - cutting and filling for percentage recovery
 - concrete casting
 - assembling of structures and,
 - slope stabilization.
- The foundations of the lattice structures and concrete casting may be dug mechanically. The depth will be consistent with the geotechnical study and the engineering designs.
- Vegetation clearing will be done manually.
- A number of transport vehicles shall be employed in the project but there will be no on-site maintenance of vehicles.
- Powered equipment is expected to be used in the construction (as required) as well as earth moving equipments such as excavators, compactors, bulldozers and pay loaders;
- Skilled and unskilled labour shall be employed in the project.

1.5 Rationale for ESMP

The World Bank safeguard policies are designed to ensure that projects proposed for financing by the Bank or its affiliate Agencies are environmentally and socially sustainable, and thus improve the decision-making process associated with the project. The NEWMAP project is being funded by the World Bank and other affiliate agencies. The ground interventions as proposed for the Malumfashi stormwater drainage project will address, prevent and expectedly reverse the perennial flooding and land degradation within the project areas, and will involve construction of civil works and rehabilitation of the existing flood plain. These activities, according to the NEWMAP ESMF, trigger the WB Safeguard Policies that include Environmental Assessment (OP/BP 4.01), Involuntary Resettlement (OP/BP 4.12), Cultural Physical Property (OP 4.11).

In fulfillment of the World Bank safeguard policy requirements, and considering the high magnitude and level of significance of the environmental and social impacts associated with the Malumfashi stormwater drainage interventions, the ESMP serves as a safeguard instrument that documents the necessary mitigation, monitoring and institutional actions to be carried out with the implementation of the subproject to eliminate adverse environmental and social impacts or reduce them to an acceptable level.

The Malumfashi project consist of remedial structural and non-structural developments that include civil works and earth works, and vegetative protection to prevent further erosion and land degradation as well as provide aesthetic view along the stormwater drainage corridors. These activities will result in several environmental and social impacts which must be considered and properly addressed to ensure that the environment is not further degraded unreasonably and the

socioeconomic life of the people is not adversely disrupted. Consequent upon these, this ESMP is required to provide necessary procedures and criteria that will guide the proposed Malumfashi stormwater drainage intervention in accordance with the World Bank Safeguard Policies and the Nigerian national environmental policies, guidelines and assessment procedures as well as those of Katsina State and the local agencies.

1.6 ESMP Objective:

The objective is to prepare an Environmental and Social Management Plan (ESMP) for the, Malumfashi, stormwater drainage intervention project. This ESMP specifically identifies and assesses the environmental and social impacts that may be associated with the planned intervention projects as designed and all other activities aimed at rehabilitating the drainage corridors within the project watershed. The ESMP also identifies, evaluates and documents the set of mitigation, monitoring and institutional actions to be taken before, during and after remedial construction and rehabilitation works to eliminate any identified adverse environmental and social impacts, offset the impacts or reduce the impacts to acceptable levels.

The potential impacts associated with the phases of the designed site interventions consisting of pre-construction, construction, and operation and maintenance (O&M) are developed and appropriate mitigation measures established for the impacts. This Environmental and Social Management Plan (ESMP) includes measures needed to implement the identified actions, addressing the adequacy of the monitoring and institutional arrangements for the upper and lower watersheds on a sustainable basis. The ESMP provides necessary institutional framework and monitoring actions to be taken before, during and after the construction and development works.

This ESMP also includes measures necessary to implement identified actions, addressing the adequacy of the monitoring and institutional arrangements for mitigation of all identified environmental and social impacts associated with the project on a sustainable basis. The mitigation measures adopted are guided by and consistent with recommendations in the updated Environmental and Social Management Framework (ESMF) for NEWMAP.

The following project-specific background documents were reviewed and together with collected field-based information and data formed basis upon which analytical determinations were made for this ESMP:

- Updated Environmental and Social Management Framework (ESMF)
- NEWMAP Project Appraisal Document (PAD)
- NEWMAP Project Implementation Manual (PIM)
- World Bank Safeguards policies
- Intervention design
- ToR For ESMP

1.7 Phases of Intervention Works:

The proposed project scope of work can generally be divided into three phases, namely:

1. Pre-construction phase;
2. Construction phase; and,
3. Post-construction (maintenance) phase.

1.7.1 Pre-construction Phase

As part of the pre-construction stage, SMEnv/KTS-NEWMAP commissioned ENPLAN Group to develop the detailed engineering design for the remedial intervention and development of the stormwater drainage systems in Malumfashi, town. The preparation of this ESMP and a separate Resettlement Action Plan (RAP) forms part of the pre-construction phase. The commencement of the remedial construction activities is expected to begin after the completion of the ESMP and RAP process.

1.7.2 Construction Phase

The construction of the flood and erosion control infrastructure for the target towns and the drainage systems development activities, will require the use of existing access roadways to reach sections of the project locations. Some of these access roadways will need to be rehabilitated as part of the construction works.

The preparation of the construction staging areas will require some localized vegetation clearance along the stormwater drainage corridors and the removal of incipient solid waste materials. Materials arising from excavations for the drainage corridors, foundations, stabilization walls (soil, rock etc.) and installation of gabions would be used to fill appropriate areas. The foundations will be in-filled with cement supplied via ready-mix-cement trucks or alternatively mixed on site. Vegetation clearing may be done manually or mechanically. A number of transport vehicles will be employed in the project but there will be no on-site maintenance of vehicles. The power equipment is expected to be used in the construction including power saws and compressors to break hard ground (if required). Earth moving equipment such as excavators, compactors, bulldozers and pay loaders will also be used at the site. Additionally, skilled and unskilled labor will be employed during the project implementation.

1.7.3 Post-Construction (Operations & Maintenance) Phase

Routine visual inspection and maintenance of the rehabilitated stormwater drainage corridors are expected. Access rights may need to be retained through the community watershed association to allow for maintenance works in the future. The flood and erosion control corridor will require routine periodic maintenance of the site infrastructure (culverts, gabions, drainage channels, roadways etc) as well as necessary oversight of any economic trees associated with the project.

CHAPTER 2: INSTITUTIONAL AND LEGAL FRAMEWORK

This ESMP is guided by the requirements of the relevant and applicable state, national and international regulation, guidelines, conventions, industrial best management practices including the World Bank safeguard policies that are triggered by the project. The relevant legal and institutional framework applicable to NEWMAP has been fully discussed in the ESMF. These legal requirements and regulations are summarized below:

2.1 World Bank Environmental and Social Safeguard Policies

2.1.1 Triggered WB Safeguard Policies

The WB Integrated Safeguard Data Sheet (ISDS) for NEWMAP indicates that only three of the WB Safeguard Policies may be triggered by the project. These include OP 4.01 Environmental Assessment; OP 4.12 Involuntary Resettlement and OP 7.50 Projects on International Waterways. Based on the scope of construction and rehabilitation works required in the stormwater drainage rehabilitation interventions at, Malumfashi, town as well as the specific rehabilitation activities proposed, Table 2.1 (Triggered Safeguard Policies for Malumfashi,) summarizes the World Bank Safeguard Policies determined to be triggered by the four Sub-projects.

Table 2.1: Triggered Safeguard Policies

WB Safeguard Policy	Triggered by NEWMAP?		Triggered by Malumfashi Rehab Projects?		Applicable To Project Due To	How Project Addresses Policy Requirements
	YES	NO	YES	NO		
Environmental Assessment (OP/BP4.01)	[x]	[]	[x]	[]	Civil works with site-specific impacts	ESMF prepared for NEWMAP & site specific mitigation measures developed in this ESMP
Natural Habitats (OP/BP4.04)	[]	[x]	[]	[x]	NA*	NA
Pest Management (OP 4.09)	[]	[x]	[]	[x]	NA	NA
Physical Cultural Resources (OP/BP 4.11)	[]	[x]	[x]	[]	This policy is not triggered by NEWMAP. However, the existence of cultural relics within the project areas may be an issue for consideration	This ESMP spells out appropriate site specific mitigation measures in the event of existence of any cultural relics
Involuntary Resettlement (OP/BP4.12)	[x]	[]	[x]	[]	Restriction of access to sources of livelihood.	RPF prepared for NEWMAP will guide required resettlements at the Malumfashi project locations. A standalone RAP is necessary to spell out site specific issues to be addressed & how.
Indigenous Peoples (OP/BP4.10)	[]	[x]	[]	[x]	NA	NA
Forests (OP/BP4.36)	[]	[x]	[]	[x]	NA	NA
Safety of Dams (OP/BP4.37)	[]	[x]	[]	[x]	NA	NA
Projects in Disputed Areas (OP/BP7.60)*	[]	[x]	[]	[x]	NA	NA

WB Safeguard Policy	Triggered by NEWMAP?		Triggered by Malumfashi Rehab Projects?		Applicable To Project Due To	How Project Addresses Policy Requirements
	YES	NO	YES	NO		
Projects on International Waterways (OP/BP7.50)	[x]	[]	[]	[x]	Katsina state is not a coastline state in Nigeria. The subproject therefore does not trigger this policy	NA

NA* = Not Applicable

The applicable World Bank safeguard policies identified for Malumfashi subprojects include: OP 4.01 Environmental Assessment, OP 4.11 Physical Cultural Resources and OP 4.12 Involuntary Resettlements. These World Bank safeguard policies are summarized as follows:

2.1.2 Environmental Assessment (EA) (OP 4.01):

An EA is conducted to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. Any World Bank project that is likely to have potential adverse environmental risks and impacts in its area of influence requires an EA indicating the potential risks, mitigation measures and environmental management framework or plan.

2.1.3 Physical Cultural Resources (OP 4.11):

This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

2.1.4 Involuntary Resettlement (OP 4.12):

Key objectives of the World Bank's policy on involuntary land acquisition are to avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; assist displaced persons in improving their former living standards, income earning capacity and production level, or at least in restoring them; encourage community participation in planning and implementing resettlement; and provide assistance to affected people regardless of the legality of land tenure. The policy covers not only physical relocation, but any loss of land or other assets resulting in relocation, or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihood whether or not the affected people must move to another location. When the policy is triggered, a Resettlement Action Plan (RAP) must be prepared. An abbreviated plan may be developed when less than 200 people are affected by the project. In situations, where all the precise impacts cannot be assessed during project preparation, provisions are made for preparing a Resettlement Policy Framework (RPF). The RAP/RPF must ensure that all Bank's policy provisions detailed in OP 4.12 are addressed particularly the payment of compensation for affected assets at their replacement cost.

2.2 Federal Policy, Legal, Regulatory and Administrative Frameworks

Pursuant to Section 20 of the Nigerian 1999 Constitution, the state is empowered to

protect and improve the environment and safeguard the water, air, and land, forest, and wildlife of Nigeria. The power to regulate all environmental matters in Nigeria is vested in the Federal Ministry of Environment (FMEnv) – a mandate that previously rested with the now defunct Federal Environmental Protection Agency (FEPA) set up by Federal Act 88, of 1988.

The applicable environmental laws include the Environmental Impact Assessment Act No. 86 of 1992; the National Guidelines and Standards for Environmental Pollution Control in Nigeria (March 1991); the National Environmental Standards and Regulations Enforcement Agency (establishment) Act 2007 (NESREA), the Land Use Act 1978 (modified in 1990); the Forestry Act 1958; and the National Agricultural Policy 1988.

2.2.1 National Policy on Environment

The national policy on environment, 1989 (revised 1999), provides for “a viable national mechanism for cooperation, coordination and regular consultation, as well as harmonious management of the policy formulation and implementation process which required the establishment of effective institutions and linkages within and among the various tiers of government – federal, state and local government”. The defined guideline and strategies provide for the effective management of the environment in the following 14 major areas:

Human population; Land use and soil conservation; Water resource management; Forestry; Wildlife and protected areas; Marine and coastal area resources; Toxic and hazardous substances; Energy production and use; Air pollution; Noise pollution; Toxic and hazardous substances; Recreational space; Greenbelts movements; and, Cultural property.

2.2.2 National Environmental Impact Assessment Act 1992:

National EIA Act 1992, Clause 2 provides that public or private sector of the economy shall not undertake or embark on or authorize projects or activities without prior consideration of the effects on the environment. The act makes an EIA mandatory for any development project, and prescribes the procedures for conducting and reporting EIA studies. As part of the effective utilization of the EIA tool, the ministry has produced sectorial guidelines.

2.2.3 Nigerian Land Use Matters

The basic legal framework for the acquisition of land in Nigeria is the Land Use Act 1978 as amended under the Amended Land Use Act of 2004, Chapter L5 under the laws of the Federation of Nigeria. The Part 1 of the amended Act 2004 vests all land within the urban areas of any Nigerian State in the Executive Governor of that state. Land within the rural areas of the state is vested on the Local Government. The Part VI, Section 29 of the law provides for compensation to the holder of any land title when such land is to be acquired for public purposes. For developed land, the Governor (in the case of urban areas) or Local Government (in the case of rural areas) may, in lieu of compensation, offer resettlement in any other place as a reasonable alternative accommodation and in acceptance of resettlement, the holder’s right to compensation shall be deemed to have been duly satisfied.

Although the Land Use Act is not strictly an Act for environmental protection, protection of the environment is one of the considerations which a holder of certificate of occupancy has to observe.

2.2.4 National Erosion and Flood Control Policy 2005:

The general soil erosion & flood control guidelines provide necessary instructions for soil and water resources users to develop, implement and monitor plans that are to assure erosion and flood hazard mitigation. The maintenance of levees and other protective structures are also to be developed at areas with potential impacts. In addition to this, all requests for project plan approvals must include soil type and drainage pattern/structures in and around project area and the likely impact of the project on these duly certified.

2.2.5 NESREA Establishment Act, 2007.

The National Environmental Standards and Regulations Enforcement Agency (NESREA) has responsibility for the enforcement of the environment regulations and biodiversity conservation, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.

The following NESREA National Environmental Regulations are considered relevant in this study:

- National Environmental (Construction Sector) Regulations. 2011;
- National Environmental (Soil Erosion and Flood Control) Regulations. 2011;
- National Environmental (Desertification Control and Drought Mitigation) Regulations. 2011;
- National Environmental (Surface and Ground Water Control) Regulations. 2011;
- National Environmental (Watershed, Mountainous, Hilly and Catchment Areas) Regulations, 2009.

2.2.6 National Guidelines and Standards for Environmental Pollution (March, 2001):

The National Guidelines and Standards for environmental pollution control in Nigeria (March, 2001) is the basic instrument for monitoring and controlling industrial and urban pollution.

2.2.7 National Waste Management Regulations of 1991

This regulation which is updated under the National Environmental (Sanitation and Waste Control) Regulations 2009, S.I. No. 28 mandates the collection, treatment, and disposal of solid and hazardous waste from municipal and industrial sources. It provides the legal framework for the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution.

2.2.8 Approved National Forestry Policy 2006

The extant national forest policy which is included within the document "Agricultural Policy for Nigeria" published by the Federal Ministry of Agriculture in 1988 recognized forestry as the management and utilization of forests as renewable natural resources. The policy overall objective is to achieve sustainable forest management that would ensure sustainable increases in the economic, social and environmental benefits from forests and trees for the present and future generation including the poor and the vulnerable groups.

The Forest Policy encourages and supports an aggressive establishment of plantations of economic trees of both exotic and indigenous species. It provides for the preservation of forest and the setting up of forest reserves, and also provides

goals, targets and implementation strategies for the management, development and use of forests and their resources and products. Nigeria is at present a wood deficit nation. The policy on forest resources management and sustainable use is aimed at achieving self-sufficiency in all aspects of forest product through the use of sound forest management techniques as well as the mobilization of human and material resources. The overall objectives of forest policy are to prevent further deforestation and to recreate forest cover, either for productive or for protective purposes, on already deforested fragile land.

The national biodiversity conservation strategy continues to be based on a system of Protected Areas, including Forest Reserves, National Parks and Game Reserves. In recognition of the fact that the local communities must share from the benefits of these Protected Areas, there must be a meaningful participation of these communities in their management. Efforts to safeguard biodiversity in private forests and to improve agricultural biodiversity through farm forestry initiatives must be supported.

Government has signed a number of international agreement and conservators that are relevant to the forestry development. It is obligatory that Government should honour these agreements and instruments through domestic legislation; and action. Intergovernmental, bilateral and multilateral cooperation will be upheld to promote sustainable development of forest resources.

2.3 Other Relevant Acts and Legislations at Federal Level

Nigeria subscribes to a number of international regulations and conventions relating to Environmental Protection. The assessments and management standards of these international development partners/agencies, such as World Bank and other financial organizations, must be complied with by project proponents before these institutions will invest in the projects. These guidelines/conventions/treaties to which Nigeria is a signatory are summarized below.

2.3.1 The Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Disposal, 1989

The convention focuses attention on the hazards of the generation and disposal of hazardous wastes. The convention defines the wastes to be regulated and controls their trans-boundary movement to protect human and environmental health against their adverse effects.

2.3.2 UN Framework Convention on Climate Change – Kyoto Protocol (1992)

In order to achieve sustainable social and economic development, energy consumption for developing countries needs to grow taking into account the possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general. This also includes the application of new technologies on terms which make such an application economically and social beneficial, determined to protect the climate system for present and future generations.

2.3.3 Agenda 21 - UN Conference on Environment and Development

At the United Nations Conference on Environment (also the Earth Summit) – held in Rio de Janeiro (1992), with recommendations from the WHO Commission, more than 150 member states adopted Agenda 21 - an action plan to guide future strategies for health and environment activities on a national and international level. This fact provided the background for FEPA's EIA framework to ensure

environmental sustainability of all types of activities in the oil and gas industry (FEPA, 1995).

2.3.4 Public Health Legislations and regulations

Several countries have legislation and regulations that stipulate the administrative and policy framework for conducting health impact assessment for a development project, whether as part of an EIA or a standalone study. In addition, a number of international agencies have endorsed this process, such as the World Banks, Asian Development Commission, and the World Health Organizations. In Nigeria, the Public Health Law (L.N47 of 1955, Cap 103) provides justification for the execution of developmental projects under guidelines that promote health by protecting the environment and safeguarding the health of humans.

2.3.5 WHO Health and Safety Component of EIA, 1987

WHO in its report on health and safety component of environment impact assessment (EIA) to protect human health indicates that:

- i. One of the fundamental considerations in the approval of projects, policies and plans should be the health of communities affected by them; greater consideration should be given to the consequence of development policies/programs for human health;
- ii. Environmental Impact Assessment should provide the best available factual information on the consequence for health of projects, policies and plan; and
- iii. Information on health impact should be available to the public.

2.3.6 Convention on Conservation of Migratory Species of Wild Animals, Bonn, 1979

The Bonn convention concerns the promotion of measures for the conservation (including habitat conservation especial for endangered species and management of migratory species.)

2.3.7 United Nations Guiding Principle on the Human Environmental

The United Nation (UN) published the concept of guiding principles on the Human Environment in 1972. Ten of these Guiding Principles were defined as formal declarations that express the basis on which an environmental policy can be built and which provide a foundation for action.

2.3.8 The Rio Declaration on Environmental and Development

The UN Conference on Environment and development met at Rio de Janeiro in June 1992, at which time it reaffirmed the 1972 declaration on the Human Environment, and sought to build upon it. This was done with the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among states, key sectors of societies and people. It was also to aid work towards international agreements, which respect the interest of all, protect the integrity of the global environmental development system, and recognize the integral and interdependent nature of the earth.

Other relevant international conventions include:

- Africa Convention on the Conservation of Natural Resources of 1969
- Convention on the Law of the Seas of 1982
- The Ramsar Convention on Wetlands of 1971

2.4 State Legislations

2.4.1 Katsina State Waste Management Act

This Act provides for the effective development and maintenance of sanitation in all areas of the State. The law further provides for proper disposition of excavated silt or earth and other construction materials after any construction project or repair works. Open burning of wastes is prohibited with stipulated penalties.

2.5 Gaps between Nigerian Legislation and World Bank Policies

The gaps between the triggered Nigerian current legislation and WB policies as they relate to this project are summarized in Table 2.2 below:

Table 2.2: Gaps between Nigeria Legislation and WB Policies

Project Triggered Policies	Nigerian Legislation	World Bank Policy	Gaps Between the Policies
OP 4.01 Environmental Assessment	National EIA Act 1992, Clause 2 provides that public or private sector of the economy shall not undertake or embark on or authorize projects or activities without prior consideration of the effects on the environment. The act makes an EIA mandatory for any development project, and prescribes the procedures for conducting and reporting EIA studies. As part of the effective utilization of the EIA tool, the ministry has produced sectorial guidelines. Responsibility for monitoring of EIA activities lies with the NESREA and State ministries of environment but these agencies lack the logistic capability to carry out the tasks assigned to it by the law	An EA is conducted to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. Any World Bank project that is likely to have potential adverse environmental risks and impacts in its area of influence requires an EA indicating the potential risks, mitigation measures and environmental management framework or plan.	Nigeria currently has a comprehensive framework for assessing and managing the environmental impacts of development projects. However, in comparison with the World Bank Safeguard Policies, it would appear that the Nigeria framework lacks the provision of clear requirements or guidance in the assessment of the impact of an activity on public health. In this case the policy of the bank prevails.
OP 4.11 Physical Cultural Resources	National Commission For Museums and Monuments Act of 1990, Chapter 242 seeks to protect and preserve any objects of archaeological interest wherever they may be found. Any person who discovers an object of archaeological interest in the course of operations permitted under section 19 of this Act shall notify the Commission.	The Bank seeks to assist countries to manage their physical cultural resources and avoid or mitigate adverse impact of development projects on these resources. This policy is triggered for any project that requires an EA.	There is no difference in the frameworks of both policies. Both policies provide for discovery and documentation and management of physical cultural resources. However, responsibility for monitoring of activities and enforcement under the Nigerian Regulations is effectively lacking. In this case the policy of the bank prevails.
OP 4.12 Involuntary Resettlement	The basic legal framework for the acquisition of land in Nigeria is the Land Use Act 1978 as amended under the Amended Land Use Act of 2004, Chapter L5 under the laws of the Federation of Nigeria. The Part 1 of the amended Act 2004 vests all land within the urban areas of any Nigerian State in the Executive Governor of that state. Land within the rural areas of the state is vested on the Local Government. The Part VI, Section 29 of the law provides for compensation to the holder of any land title when such land is to be acquired for public purposes. For developed land, the Governor (in the case of urban areas) or Local Government (in the case of rural areas) may, in lieu of compensation, offer resettlement in any other place as a reasonable alternative accommodation and in acceptance of resettlement, the holder's right to compensation shall be deemed to have been duly satisfied. Although the Land Use Act is not strictly an Act for environmental protection, protection of the environment is one of the considerations which a holder of certificate of occupancy has to observe.	Key objectives of the World Bank's policy on involuntary land acquisition are to avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; assist displaced persons in improving their former living standards, income earning capacity and production level, or at least in restoring them; encourage community participation in planning and implementing resettlement; and provide assistance to affected people regardless of the legality of land tenure. The policy covers not only physical relocation, but any loss of land or other assets resulting in relocation, or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihood whether or not the affected people must move to LIDther location. When the policy is triggered, a Resettlement Action Plan (RAP), must be prepared. An abbreviated plan may be developed when less than 200 people are affected by the project. In situations, where all the precise impacts cannot be assessed during project preparation, provisions are made for preparing a Resettlement Policy Framework (RPF).	Essentially, there is no difference in the main framework of both policies. Both policies require that compensation be paid for land acquired for public benefit. The Nigerian regulations however while lacking clear responsibility for monitoring of activities associated with compensations further lack provisions of logistics to carry out the tasks assigned to the legal enforcement agency. Lands that would be acquired for this project shall be fully compensated for in accordance with the World Bank policy and principles.

Project Triggered Policies	Nigerian Legislation	World Bank Policy	Gaps Between the Policies
		The RAP/RPF must ensure that all Bank's policy provisions detailed in OP 4.12 are addressed particularly the payment of compensation for affected assets at their replacement cost	

The summary descriptions of the WB Safeguard Policies are included as Annexure III.

CHAPTER 3: DESCRIPTION OF AREA OF INFLUENCE AND ENVIRONMENTAL BASELINE CONDITIONS

3.1 Introduction

This Section discusses the project area of influence as well as the general and specific baseline conditions that characterize the project areas. The discussions are in three parts consisting of (i) the project area of influence; (ii) general environmental conditions; and, (iii) site specific environmental conditions focusing on the Malumfashi stormwater drainage rehabilitation sites that make up the project areas.

3.1.1 General Conditions

The project area environmental characteristics which cut across the Malumfashi stormwater drainage corridors are discussed under Sections 3.2 through 3.7. The geologic and soil characteristics of the project area and the extent to which implementation of the proposed project could be affected by soil characteristics and other natural environmental factors are summarized below. The natural environmental factors include climate and vegetation, topography and landforms, hydrogeology and hydrologic patterns. Information sources for this evaluation include published literature, preparation of surface geologic map, geotechnical investigation conducted by ENPLAN Group – the engineering design Consultant for the projects, and the physical observations made during sites' inspections in the course of the Consultancy.

Prevailing climatic conditions were sourced from online and existing literature sources (see Section on References) complimenting field data to establish the project area rainfall, ambient temperature, wind direction and speed, atmospheric pressure and relative humidity. Information and data relating to the vegetation, topographic, geological, hydrogeological, hydrological and hydraulic nature of the area were used to fully characterize the sub-watershed. Road transect or quadrates method was used to sample flora/fauna.

3.2 Baseline Environmental Setting

3.2.1 Climate

Katsina State falls within the dry sub-humid agro-climatological zone of Sudan and Guinea Savannah vegetation zone. Generally, the climate of the project area is semi-arid tropical climate with marked wet and dry seasons. Rainfall is concentrated mainly in the northern hemisphere in summer when the Inter Tropical Discontinuity (ITD) or the Inter Tropical Convergence Zone (ITCZ) which forms the boundary between the moist equatorial air and the drier tropical air is located over the state. During the mid-summer months of June – August, south-westerly winds predominate and the relative humidity ranges from about 95 percent in the morning to around 65 percent in the afternoon, cumuli formed clouds develop during the day and results in frequent afternoon showers and thunderstorms, some persisting into the night.

The distribution of the summer rains is such that the average annual rainfall decreases fairly uniform from 1,500 – 1,600 mm at the southern edge of the state to 600mm at the northern edge. The state remains within the rain belt throughout the months of June – August and does not experience the inter-monsoon "little dry season" of southern Nigeria.

At the end of the Northern hemisphere summer, the ITD migrates southwards normally traversing Kaduna State in October and reaching its winter position south of the Benue/Niger confluence in November. During this transition period, the surface winds tend to vary from light south-westerly in the morning to north-easterly in the afternoon. Diurnal development of cumuli formed clouds results in little rain.

Virtually no rain falls in the project area in the months of November through March of the year. The relative humidity generally ranges from 17 to 84 percent. During the months December to February, 'harmattan' dust associated with the low-level anticyclones centred Northeast of Nigeria, occurs when high level westerlies oscillate into low Latitudes. Air temperatures vary through the year with relative coldness between November to March, with daily maximum temperatures of 30°C to 42°C and minimum temperatures of 15°C to 29°C. During April and May, the temperature rises to the maximum. (Ibrahim, A 1990).

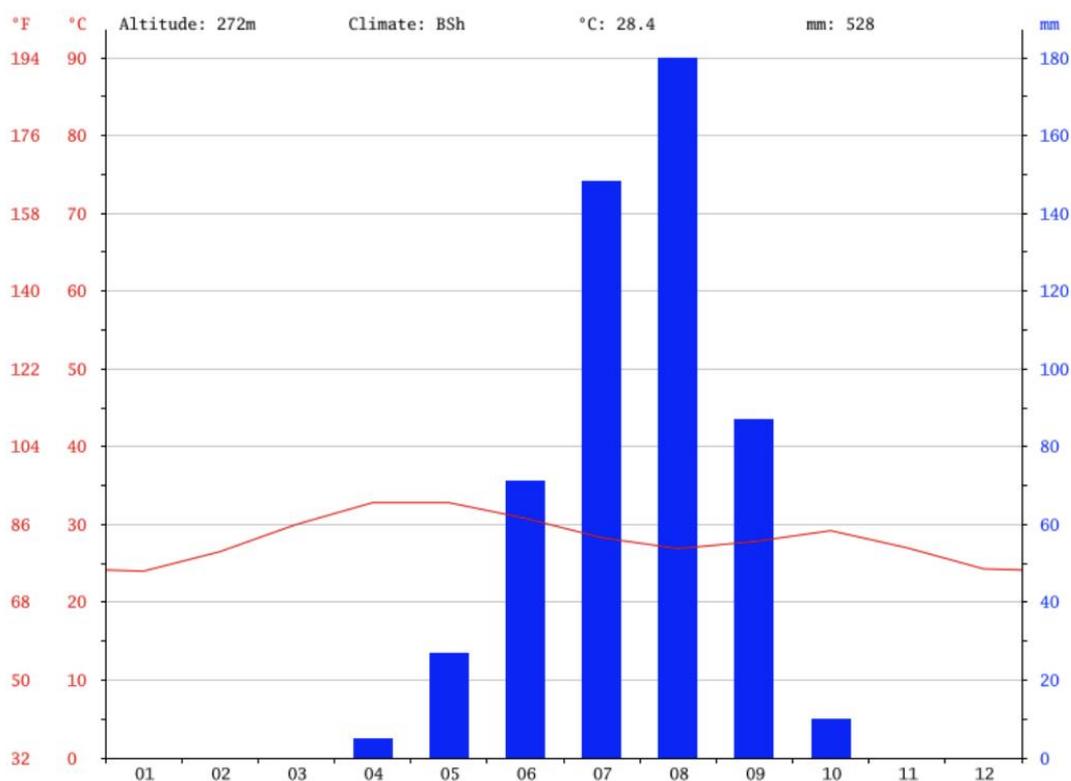


Fig. 3.1: Temperature and Rainfall Distribution in Project Areas
(Source: Climate-data.org)

The latitudinal position of Katsina State and its interior location away from the sea determine its climate and therefore its two main seasons (dry season from November to May and Wet season from June to October). The dry and rainy seasons in Nigeria come into existence due to the movement of the north-east winds and the south-west winds, respectively. The south-westerly winds are full of moisture and blusters from the Atlantic Ocean whereas the north-easterlies are dry and dirt-laden winds that primarily blow from the deserts of Sahara. The hot and dry Harmattan (northeast) winds from the Sahara sweep across Katsina State and the project areas between November and February at wind speeds of between 2.3 mph and 6.15 mph, carrying a reddish dust from the desert while the southwest winds bring cloudy rainy weather between late June and October of each year. The Katsina

climate is mostly hot with maximum day temperature reaching 40°C during the peak of the hot season (May).

Typically, the area is affected by two the wind patterns, the harmattan wind from the Sahara which is responsible for the cool dry months of November to February (about 24°C) and the Southwest Monsoon Trade Winds blowing across the Atlantic Ocean which is responsible for the rains of June to October as shown in Figure 3-1. Average relative humidity is put at 42%. The average rainfall is from about 800mm to 1000mm. (Tukur, A 2014). Figure 3-1 shows the plot of average monthly temperature and rainfall distribution through the year.

3.2.2 Geology and Hydrology

The geologic and soil characteristics of the project area and the extent to which implementation of the proposed project could be affected by soil characteristics and other natural environment factors are summarized below. The natural environmental factors include climate and vegetation, topography and landforms, hydrogeology and hydrologic patterns. Information sources for this evaluation include published literature, geotechnical investigations conducted by Enplan Group - the engineering design Consultant for this project and the physical observations made during site visit in the course of the Consultancy.

Geology of Katsina State

Katsina State is underlain by three geological units with distinct hydrogeological conditions, namely the Basement Complex, Katsina-Daura Sediments and the Chad Formation. There are also surficial Quaternary deposits that cover the Basement Complex and other sedimentary formations to a large extent. These are thin but generally discontinuous deposits of aeolian sand, lateritic ironstone, loamy drift, swamp and river alluvium. The Basement Complex includes the oldest known rocks in Northern Nigeria and is composed of gneiss, migmatites and metasediments of Pre-cambrian age. Almost 90% of the entire landmass in Katsina State is composed of Basement Complex of Pre-Cambrian era which consists of metasediments that have been transformed into antactite migmatites and granites (Ayok, 1994).

The mineral assemblages correspond to those of the amphibolite facies (Ibrahim, 2002). Generally, the summary of Geology of Katsina State can be grouped into: Cretaceous Gundumi Formation, undifferentiated Basement Complex, Quaternary Chad Formation, undifferentiated metasediments and Basement Complex-older granites. On the geochronology, the radiometric data on the geology of the area is scarce (Ayok, 1994). Those available cannot demarcate the real age relationship between the different schist belt and the adjacent migmatite-gneiss complex (Ibrahim, 1990). They consist of Archean rocks, deformed and modified several times by Pan Africa Orogeny.

Outcrops consist almost entirely of resistant migmatites, quartzites, conglomerates and granites, although there are small exposure of softer gneisses and semi-pelitic rocks in some stream channels. Rocks of the migmatitic-gneiss Basement Complex constitute the majority in areal extent (McCurry, 1970). The younger metasediments are the second most abundant rock type (occupying about 33% of the state), while some most of the western part is underlain by the granites. Others include the Chad Formation and the Gundumi Formation which occupy about 11% of the total area of Katsina State.

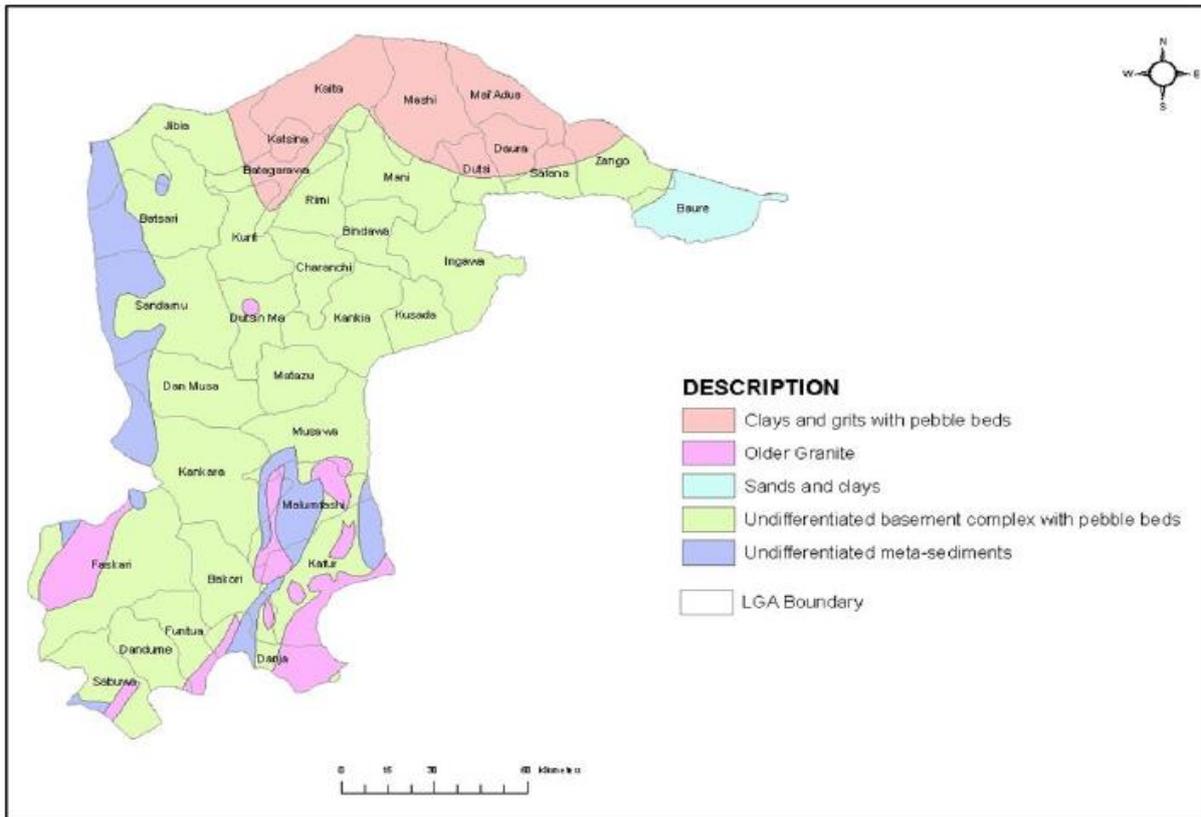


Fig. 3.2: Geology of Katsina State

Source: Enplan Group Engineering Design Report (Nov. 2018)

3.2.2.1 Malumfashi LGA

According to (Mustapha, 2014) , malumfashi area is made up of two contrasting rock types; the metasediments and the older granites. The metasediments comprising of migmatites, gneiss, schist, and the older granites are made up of porphyritic biotite granite, the medium to fine grained granite and rhyolite occurring in each fault zone. The region is dominated with granitic rocks characterized by dominant North-South structural trends. The structural analysis of the area reveals that these features are largely imprints of pan- Africa orogeny (which has a well-defined North-South trend) and partially due to older obliterated events.

The major intrusion of quartz veins, pegmatite veins and minor intrusions of micro granites dykes are also present. These are the last rock units that were emplaced in the area which later followed by superficial soil cover, which are recent in age and derived from weathering of the rock units mentioned above.

3.2.3 Soil Types

The soil around MalumfashiDrains are predominantly silty sand and clayey sand due to the sandy nature of the wind-blown desert sand. However, there are some deposits of Aeolic sand along the inverts of the drains.

3.2.4 Biodiversity

The ecological survey of the immediate project area provides necessary information about the wildlife (vegetation cover and fauna) of the area, which is a vital indicator of its ecological dynamics. It also provides baseline information that can be useful for monitoring and the assessment of project implementation effectiveness.

3.2.4.1 Vegetation

Katsina state is predominantly Sudan Savanna which consists of scattered trees with sparse shrubs and grass. The trees here grow long tap roots and thick barks that make it possible for them to withstand the long dry season. The grass too has long durable roots which remain underground after stalks are burnt away or wilted in the dry season only to germinate with the first rains. This area has been subjected to many years of bush burning and over grazing. Trees such as *Azadirachia indica* (Neem) and *Perkia biglobosa* (Locust Bean) are now being planted to check against desert encroachment and erosion.

The vegetative cover of the project area is highly heterogeneous due to severe anthropogenic disturbance. Sampling of flora and fauna in the project area was conducted using quadrats in each of the identified land use categories and 100% enumeration of trees within each quadrat was carried out. Known species and others species of interest were identified and classified using standard taxonomic procedures. A listing of plant species with frequent or abundant distribution identified in the various categories are shown in Table 3-1

Table 3.1: Listing of Prominent and Indicator Plant Species within Malumfashi Project Area

S/N	Species	Family	Life Form	Common Name	Local Name	Distribution
1	<i>Butyrospermum Parkii</i>	Sapotaceae	Tree	Shea butter	kadanya	Common
2	<i>Vitex doniana</i>	Verbanaceae	Tree	Black plum	Dinya	Common
3	<i>Khaya senegalensis</i>	Meliaceae	Tree	Mahogany	Madaci	Common
4	<i>Celtis integrifolia</i>	Ulmaceae	Tree	African Hackberry	cuwo	Common
5	<i>Sclerocarya birrea</i>	Anacardiaceae	Tree	Marula	dania	Rare
6	<i>Lannea schimperi</i>	Anacardaceae	Tree	Lannea	Faru	Rare
7	<i>Adenium obesum</i>	Apocynaceae	Tree	Desert rose	Gariya	Rare
8	<i>Borassus aethiopum</i>	Arecaceae	Tree	Fan palm	Giginya	Rare
9	<i>Hyaphaene thebaica</i>	Arecaceae	Tree	Dum palm	Goruba	Rare
10	<i>Calotropis procera</i>	Asclepiadaceae	Shrub	Swallow swort Leptadenia	Tumfafiya Dan barawo	Common
11	<i>Leptadenia hastata</i>	Asclepiadaceae	Shrub	Leptadenia	Dan barawo/yadiya	Common
12	<i>Asparagus Africana</i>	Asparagaceae	Tree	Asparagus	Sarka	Rare
13	<i>Aspilia Africana</i>	Asteraceae	Herb	Haemorrhage plant	Yunyun	Common
14	<i>Adansona digitata</i>	Bombacaeae	Tree	Baobab	Kuka	Common
15	<i>Cadaba farinosa</i>	Capparidaceae	Shrub	Cadaba	Hanza	Rare
16	<i>Anogeissus leiocarpa</i>	Combretaceae	Tree	Axle wood	Marke	Common
17	<i>Combretum micranthum</i>	Combretaceae	Shrub	Combretum	Geza	Common
18	<i>Combretum nigricans</i>	Combretaceae	Shrub	Combretum Moshi	Tsiriri	Rare
19	<i>Guiera senegalensis</i>	Combretaceae	Tree	Moshi medicine	Sabara	Rare
20	<i>Ipomea asarifolia</i>	Convolvulaceae	Tree	Morning glory	Duman kadda	Rare
21	<i>Diospyros mespiliformis</i>	Ebenaceae	Tree	Ebony tree	Kaiwa	Rare
22	<i>Acacia macrostachya</i>	Fabaceae	Tree	Acacia	Gardaye	Common
23	<i>Acacia nilotica</i>	Fabaceae	Tree	Acacia	Bagaruwa	Common
24	<i>Acacia senegalensis</i>	Fabaceae	Tree	Acacia	Farar Kaya	Common
25	<i>Bauhinia rufescens</i>	Fabaceae	Tree	Bauhinia	Jirga	Common
26	<i>Cassia fistula</i>	Fabaceae	Tree	Golden shower	Malga	Common
27	<i>Cassia singueana</i>	Fabaceae	Shrub	Winter cassia	Runfu	Common
28	<i>Dichrostachys cinerea</i>	Fabaceae	Shrub	W. Afri. Sickle	Dundu	Common

S/N	Species	Family	Life Form	Common Name	Local Name	Distribution
29	<i>Mimosa pigra</i>	Fabaceae	Shrub	Sensitive plant	Gumbi	Common
30	<i>Piliostigma thonningii</i>	Fabaceae	Shrub	Camel's foot	Kalgo	Common
31	<i>Tamarindus indica</i>	Fabaceae	Tree	Tamarin	Tsamia	Common
32	<i>Azadirachta indica</i>	Meliaceae	Tree	Neem	Dogon yaro	Common
33	<i>Moringa oleifera</i>	Moringaceae	Tree	Medicine tree	Zogale	Common
34	<i>Psidium guajava</i>	Myrtaceae	Tree	Guava	Gwava	Rare
35	<i>Rogeria adenophylla</i>	Pedaliaceae	Tree	Tanum	Loda	Rare
36	<i>Ziziphus mauritiana</i>	Rhamnaceae	Tree	Jujub	Magarya	Rare
37	<i>Feretia apodanthera</i>	Rubiaceae	Tree	Feretia	Kurukuru	Rare
38	<i>Balanites aegyptiaca</i>	Zygophyllaceae	Tree	Desert date	Aduwa	Common
39	<i>Pterocarpus erinaceus</i>	Fabaceae	Tree	Barwood	Madobihia	Common
40	<i>Prosopis africana</i>	Fabaceae	Tree	Iron tree	Kiriya	Common
41	<i>Commiphora Kerstingii</i>	Burseraceae	Shrub	Fula-Fulfulde	Bazana	Common
42	<i>Ricinus communis</i>	Euphorbiaceae	Shrub	Castor	Zurma	Common
43	<i>Aegilops cylindrica</i>	Poaceae	Herb	Goat weed	katankahaya	Common
44	<i>Pennisetum purpureum</i>	Poaceae	Herb	Elephant grass	Hatsi	Common
45	<i>Imperata cylindrica</i>	Poaceae	Herb	Spear grass	jema	Common
46	<i>Digitaria sanguinalis</i>	Poaceae	Herb	Finger grass	-yadi	Common
47	<i>Megathysia madameb</i>	Poaceae	Herb	Guinea grass	-Gamba	Common
48	<i>Bromus catharticus</i>	Poaceae	Herb	Prairie grass		Common
49	<i>Arvena fatua</i>	Poaceae	Herb	Wild oats	-	Rare
50	<i>Echinochloa crus-galli</i>	Poaceae	Herb	Crab grass	-yaryadi	Rare
51	<i>Eleusine indica</i>	Poaceae	Herb	Wire grass	-qiri qiri	Rare
52	<i>Elymus repens</i>	Poaceae	Herb	Quack grass	-katankahaya	Rare
53	<i>Panicum capillare</i>	Poaceae	Herb	Panicgrass	-tsintsiya	Common
54	<i>Setaria faberi</i>	Poaceae	Herb	Giant foxtail	-bagyazama	Rare
55	<i>Panicum maximum</i>	Poaceae	Herb	Guinea grass	-Balasaya	Common
56	<i>Cynodon dactylon</i>	Poaceae	Herb	Bermuda grass	Sarkakiyar zomo	Common
57	<i>Cyperus esculentus</i>	Cyperaceae	Herb	Yellow nutgrass	Jiji	Rare
58	<i>Bromus tectorum</i>	Poaceae	Herb	Drooping brome	-	Rare
59	<i>Eriochloa villosa</i>	Poaceae	Herb	Hairy cupgrass	-inna	Rare
60	<i>Hordeum jubatum</i>	Poaceae	Herb	Squirreltail	-	Common
61	<i>Muhlenbergia frondosa</i>	Poaceae	Herb	Common satin grass	-gadagi	Common
62	<i>Panicum dichotomiflorum</i>	Poaceae	Herb	Fall panicgrass	-	Rare
63	<i>Setaria pumila</i>	Poaceae	Herb	Pigeon grass	-kainuwa	Common
64	<i>Cymbogon citratus</i>	Poaceae	Herb	Lemon grass	-balasaya	Common

Source: Field Survey, July, 2019.

Table 3.2: Major Cultivated/Agronomic Species Along the Malumfashi Project Site

S/N	Species	Family	Life Form	Common Name	Local names	Distribution
1	<i>Vigna Unguiculata</i>	Fabaceae	Herb	Cowpea	Wake	Common
2	<i>Gossypium hirsutum</i>	Malvaceae	Herb	Cotton	Auduga	Rare
3	<i>Mangifera indica</i>	Anacardiaceae	Tree	Mango	<i>Mangworo</i>	Rare
4	<i>Anacardium occidentale</i>	Anacardiaceae	Tree	Cashew	<i>Yazawa</i>	Rare
5	<i>Citrus sinensis</i>	Rutaceae	Tree	Orange	<i>Lemo</i>	Rare
6	<i>Zea mays</i>	Poaceae	Shrub	Maize	<i>Masara</i>	Common
7	<i>Musa paradisiaca</i>	Musaceae	Shrub	Plantain	<i>Ayaba</i>	Rare
8	<i>Manihot esculenta</i>	Euphobiaceae	Shrub	Cassava	<i>Rogo</i>	Common
9	<i>Terminalia catapa</i>	Combretaceae	Tree	Umbrella Tree	Bawshi	Rare
10	<i>Terminalia spp</i>	Combretaceae	Tree	Cameroon Tree	Bawshi	Rare
11	<i>Ixora spp</i>	Rubiaceae	Shrub	Ixora	-Dan miski	Rare
12.	<i>Eucalyptus spp</i>	Myteraceae	Tree	Eucalyptus	turare	Rare
13.	<i>Oryza sativa</i>	Gramineae	Herb	Rice	<i>Shinkafa</i>	Common
14	<i>Allium cepa</i>	Amaryllidaceae	Herb	Onion	<i>Albasa</i>	Common
15	<i>Allium sativum</i>	Amaryllidaceae	Herb	Garlic	<i>tafarnuwa</i>	Common
16	<i>Capsicum annum</i>	Solanaceae	Herb	Pepper	Tattasai/sham bo	Common
17	<i>Ipomoea batatas</i>	Convolvulaceae	Herb	Sweet potato	Dankali	common
18	<i>Pennisetum glaucum</i>	Poaceae	Shrub	Millet	Gero	Common
19	<i>Sorghum bicolour</i>	Poaceae	Shrub	Guinea corn	Dawa	Common
20	<i>Zingiber Officinale</i>	Zingiberaceae	Herb	Ginger	Citta	Common
21	<i>Saccharum officinarum</i>	Poaceae	Shrub	Sugarcane	Rake	Common
22	<i>Sesamum indicum</i>	Pedaliaceae	Herb	Benniseed	Ridi	Common
23	<i>Musa sapientum</i>	Musaceae	Shrub	Banana	Ayaba	Rare
24	<i>Solanum melongena</i>	Solanaceae	Shrub	Egg plant	Yalo	Rare
25	<i>Arachis hypogaea</i>	Fabaceae	Herb	Groundnut	Gyada	Common

Source: Field Survey, July, 2019.

3.2.4.2 Animal Inventory of the Watershed

Domestic Animals: These include mammal such as cattles, goats, sheep, ram, donkeys and dogs; and aves such as local fowls and agricultural fowls.

Wild Animals: These terrestrial animals were observed to be present in the site: *Thryonomys swinderianus* (Grass cutter/giant rat), *Cricetomys gambianus* (Bush/giant rat), *Xerus erythropus* (Ground squirrel). Other animals seen include Milipedes, Centipedes, Snake, Ant, Butterflies and Birds. Of the above mentioned, *Thryonomys swinderianus* (Grass cutter) and *Cricetomys gambianus* (Bush/giant rat), were reported to be the most abundant species in the site. It was reported by the locals that these animals are gradually disappearing. This could be attributable to habitat loss due to urbanization and farming activities occurring at the site since some of these animals are burrowing animals. Another factor could be uncontrolled hunting. None of existing reported animals are listed on the International Union for the Conservation of Nature (IUCN) endangered red list.

Table 3.3: Animal Species at the Malumfashi Project Site

S/No	Species	Common/Local name	IUCN Threat Status
1	<i>Bos Taurus</i>	Cattle/shanu	Not listed
2	<i>Capra aegagru</i>	Goat/awaki	Not listed
3	<i>Ovis aries</i>	Sheep/Tumaki	Not listed
4	<i>Eguus africanus</i>	Donkey/Jaki	Not listed
5	<i>Gallus gallus</i>	Chicken/Kaji	Not listed
6	<i>Meleagris spp</i>	Turkey/Tolotolo	Not listed
7	<i>Camelus dromedarius</i>	Camel/Rakumi	Not listed
8	<i>Rattus norvegicus</i>	Rat/bera	Not listed
9	<i>Thryonomys swinderianus</i>	Grasscutter/Burgu	Not listed
10	<i>Oryctolagus cuniculus</i>	Rabbit/Zomo	Not listed
11	Serpentes spp	Snake/Maciji	Not listed
12	Alligator mississippiensis	Aligator/Damo	Not listed
13	<i>Canis lupus</i>	Wolf/Kyarkeci	Not listed
14	<i>Hystricognathi spp</i>	Porcupine/Bushiya	Not listed
15	<i>Agama agama</i>	Lizard/Kadangare	Not listed
16	<i>Rana ridibunda</i>	Marsh frog/Kwado	Not listed
17	<i>Columba palumbus</i>	Woodpigeon/	Not listed
18	<i>Columba livia</i>	Feral pigeon/rock dove	Not listed
19	<i>Columba oenas</i>	Stock dove	Not listed
20	<i>Apus apus</i>	Swift	Not listed
21	<i>Gavia stellate</i>	Red-throated diver	Not listed
22	<i>Ixobrychus minutes</i>	Little bittern	Not listed
23	<i>Nyctea scandiaca</i>	Snowy owl	Not listed
24	<i>Gallus gallus</i>	Chicken	Not listed
25	<i>Columba livia</i>	Pigeon	Not listed
26	<i>Numida meleagris</i>	guinea fowl	Not listed
27	<i>Accipiter striatus</i>	Hawk	Not listed
28	<i>Alcedo atthis</i>	Kingfisher	Not listed
29	<i>Upupa epops</i>	Hoopoe	Not listed
30	<i>Jynx torquilla</i>	Wryneck	Not listed
31	<i>Carassius auratus</i>	Goldfish	Not listed
32	<i>Cyprinus carpio</i>	Common carp	Not listed
33	<i>Synodontis spp</i>	Catfish/Kumgi	Not listed
34	<i>Heterobronchus bidosalis</i>	African catfish/Shambani	Not listed
35	<i>Gymnachus nilotica</i>	Aba/Youni	Not listed
36	<i>Clarias garipenus</i>	African sharp tooth catfish/Tarwarda	Not listed
37	<i>Tillapia nilotica</i>	Mango fish/Gargaza	Not listed
38	<i>Heterobronchus spp</i>	Air breathing Catfish/Ramboshi	Not listed
39	<i>Xenentodon cancila</i>	Needle fish/Kauwo	Not listed
40	<i>Tilapia zilli</i>	Redbelly tilapia/Buku	Not listed
41	<i>Anura dumeril</i>	Frog/Kwado	Not listed
42	<i>Typha angustifolia</i>	Bulrush/Shalla	Not listed
43	<i>Typha Latifolia</i>	Reedmace/Borugu	Not listed

S/No	Species	Common/Local name	IUCN Threat Status
44	<i>Lates anectus</i>	Nile perch/Rajia	Not listed
45	<i>Lates niloticus</i>	Nile perch/ Giwa ruwa	Not listed
46	<i>Gygantactis gargantua</i>	Gygantactis/Kuma mai dogo baki	Not listed
47	<i>Cymbacephalus beauforti</i>	Crocodile/Kada	Not listed

Source: Field Survey, July, 2019.

3.2.5 General Geomorphology

3.2.5.1 Slope Instability and Subsidence

The stability or instability of a slope is greatly dependent upon factors such as gradient, available water content, existing vegetation, and stresses (natural and anthropomorphic) affecting the slope. For example, a denuded, saturated slope could be further destabilized and fail if it was to be stressed by considerable earth moving activities. The terrain of the project area is relatively of undulating surfaces.

Land subsidence is the loss of surface elevation due to removal of subsurface support. Subsidence has many causes, including seismically induced stresses and the extraction of mineral or liquid and gas deposits. Although mineral and gas can and do cause subsidence, it is more common for subsidence to occur as a result of groundwater extraction in excess of groundwater recharge. There are no known studies on subsidence in the project area or surrounding region. However, subsidence in the region as a whole may be limited because the various geologic and hydrologic conditions associated with subsidence are not known to occur in the area

3.2.5.2 Natural Drainage Corridors

Major rivers which originate in or traverse Katsina state include Kozaa, Sabke, Tagwai, Gada, Karaduwa, Bunsuru, Gagare, Turami, Sokoto, etc. These rivers contain water only during the rainy season and have little or no water during the dry season. The rivers Gada, Karaduwa and Sabke have been dammed for irrigation purposes and the dams are known as Jibiya, Zobe and Dabiram Dams, respectively.

Survey maps that included Satellite Imagery and Topographic profiles were used to guide interpretations of storm water flows throughout the project area. The watershed drainage features were identified through interpretation of 5-meter contour intervals topographic map. Drainage features within the scope of this investigation included any topographic feature that could potentially concentrate surface runoff, including convergent topography, swales and existing channels.

3.2.6 Archaeology and Cultural Heritage:

There are no World Heritage Sites or areas of cultural importance that would be impacted by the proposed project, nor are there any archeologically sensitive areas. However, there is the existence of several burial grounds & other cultural relics within and inclose proximity to the project areas. This ESMP spells out appropriate site specific mitigation measures for any burial ground and other cultural relics that maybe found during the project implementation.

3.2.7 Traffic and Transport Infrastructure:

The project area is served by several rural intra-linkage roads which are now severely degraded by the floods and erosion. The access roads to the Malumfashi project areas currently experience very low level of traffic flow due to developmental and flooding/erosion problems. This is envisaged to gradually improve once the flood and erosion control intervention project is completed, and as additional residential areas develop and the road surfacing is improved.

3.2.8 Waste Management:

Waste management provision in the project area is generally lacking. Solid wastes are generally handled in individual homesteads and are either burnt or disposed of in small earth fills to rot. The major type of toilet facility owned by the households in Malumfashi projects catchment area and with which it disposes fecal wastes was covered pit latrines. Most of the people defecate in open spaces. In most cases, the wastes are indiscriminately disposed of in the environment. There are no structured waste collections within the Malumfashi catchment area resulting, to a large extent, in wastes being indiscriminately dumped in isolated places. There are also no effective sewerage works in the project area.

3.3 Site-Specific Baseline Environmental Setting

3.3.1 Malumfashi Town Baseline Setting

Soil, water and air samples were collected from various locations within the proposed Malumfashi drainage corridor. The matrix of sampling media and sampling locations for the drainage corridor are shown in Table 3.4. The collected samples were submitted to MGG Laboratory for analyses to assess the baseline environmental conditions within the project area.

Table 3.4: Sampling Locations and Coordinates along the Drainage Corridor

SAMPLING LOCATIONS AND COORDINATES ACROSS THE MALUMFASHI STORMWATER DRAINAGE CONTROL SITE				
SAMPLE MEDIA	SMAPLE MODE	SAMPLE LOCATION	CODE	COORDINATES
SURFACE WATER SAMPLE	TARGETED	MALUMFASHI BYPASS	MLF/SWR/01	N 11°47'10.4" E 007° 38'08.9
	TARGETED	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	MLF /SWR/02	N 11° 46'27.8" E 007° 37'20'.3
	TARGETED	FAIMASA BRIDGE	MLF /SWR/03	N 11° 47'09.3" E 007° 36'57.2
	RANDOM	RAFIN DINYA	MLF /SWR/04	N 11° 47'16.9' E 007° 36'49.2
SOIL SAMPLE	TARGETED	DANRIMI AREA BY BYPASS	MLF /SS/01	N 11° 47'10.4" E 007° 38'08.9
	TARGETED	MALUMFASHI BYPASS	MLF /SS/02	N 11° 46'27.5" E 007° 37'20.3
	TARGETED	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	MLF /SS/03	N 11° 47'0.93" E 007° 36'57.2
	RANDOM	FAIMASA BRIDGE	MLF /SS/04	N 11° 47'17.5" E007° 37'02.6
	RANDOM	RAFIN DINYA	MLF /SS/05	N 11° 47'16.9' E 007° 36'49.2
AIR QUALITY	TARGETED	DANRIMI AREA BY BYPASS	MLF /AS/01	N 11° 47'10.4" E 007° 38'08.9
	TARGETED	MALUMFASHI BYPASS	MLF /AS/02	N 11° 46'27.8" E 007° 37'00.3
	TARGETED	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	MLF /AS/03	N 11° 47'09.3" E 007° 36'57.2
	RANDOM	FAIMASA BRIDGE	MLF /AS/04	N 11° 47'17.5" E 007° 37'02.6
	RANDOM	RAFIN DINYA	MLF /AS/05	N 11° 47'16.9' E 007° 36'49.2
GROUND WATER	TARGETED	DANRIMI AREA BY BYPASS	MLF /GWS/01	N 11° 47'17.5" E 007° 37'02.6

3.3.1.1 Soil Analytical Conditions

Representative near-surface soil samples for laboratory analysis were collected from five locations (targeted and random) points along the proposed Malumfashi drainage corridor. Three targeted locations were selected from areas with observed environmental conditions that suggest contamination while two locations were randomly selected to depict general conditions along the drainage corridor. The sample locations are shown in Table 3.4. Each near surface soil sample (0 - 6 inches depth) was collected using the Dutch hand auger and put in a properly labeled self-sealing plastic bag for shipment to the FMEnv-certified MGG Resources Laboratory at Nsukka for chemical analysis. The baseline analytical results of the soil samples are summarized in Table 3.5.

Table 3.5: Baseline Soil Quality Analysis for Malumfashi Site

S/N	PARAMETERS TESTED	UNITS	NESREA/ FMENV LIMITS	ANALYTICAL RESULTS				
				SS1	SS2	SS3	SS4	SS5
1	pH (KCl)	-	-	6.50	7.50	8.80	6.90	7.70
2	pH (10% solution @ 25°C)	-	6.5-9.0	7.80	8.30	9.70	8.30	8.60
3	Nitrate	mg/kg	-	2.30	3.20	2.40	10.20	3.20
4	Moisture	%	-	15.07	9.99	19.62	20.19	17.79
5	Electrical conductivity	µS/Cm	-	140.80	191.40	646.80	20.80	147.40
6	Soil Colour	-	-	Yellowish	Brownish	Brownish	Yellowish	Brownish
7	Potassium (K ⁺)	mg/kg	-	0.05	0.05	0.05	0.04	0.04
8	Magnesium (Mg ²⁺)	mg/kg	-	0.40	0.20	1.20	1.60	1.00
9	Calcium (Ca ²⁺)	mg/kg	-	2.20	3.60	5.00	3.60	2.00
10	Sodium (Na ⁺)	mg/kg	-	0.02	0.02	0.02	0.02	0.02
11	Available Phosphorus	mg/kg	5	0.93	0.87	12.12	18.65	0.93
12	Organic Matter	%	-	0.46	0.77	0.39	0.19	0.31
13	Nitrogen	%	-	0.07	0.06	0.04	0.06	0.04
14	Organic Carbon	%	-	0.27	0.45	0.22	0.11	0.18
15	Iron (Fe ²⁺)	mg/kg	0.03	5.20	1.25	5.20	2.40	1.22
16	Lead (Pb ²⁺)	mg/kg	164	1.00	0.25	Bdl	Bdl	3.75
17	Copper (Cu ²⁺)	mg/kg	100	Bdl	0.13	0.19	0.07	Bdl
18	Zinc(Zn ²⁺)	mg/kg	-	0.08	0.08	0.85	0.03	0.18
19	Grain Size Distribution (Coarse Sand)	%	-	10.00	30.00	33.00	49.00	58.00
20	Grain Size Distribution (Clay)	%	-	8.00	8.00	8.00	6.00	10.00
21	Grain Size Distribution (Silt)	%	-	14.00	14.00	14.00	10.00	24.00
22	Grain Size Distribution (Fine Sand)	%	-	68.00	48.00	45.00	35.00	8.00
23	Textural Class	-	-	Sandy loamy	Sandy loamy	Sandy loamy	Loamy sandy	Sandy loamy

3.3.1.2 Surface and Ground Water Condition

To assess the surface and ground water conditions at the Malumfashi site, four representative samples of surface water and one groundwater were collected along the drainage corridor. The locations of the surface and ground water samples collected are shown in Table 3.4. The water samples were collected in a clean sampling bottle for laboratory analysis. The water sample bottles were sealed, labeled and preserved in an ice-filled chest before shipping to the MGG Resources

Laboratory at Nsukka for chemical analyses. The summary of baseline analytical results of the surface and ground water samples are as shown in Tables 3.6 and 3.7, respectively.

Table 3.6: Baseline Surface Water Quality Analysis for Malumfashi Site

S/N	PARAMETERS TESTED	UNITS	NESREA/ FMENV LIMITS	WHO LIMITS	ANALYTICAL RESULTS			
					SW1	SW2	SW3	SW4
1	Temperature	^o C	40	32-34	20.80	20.70	20.80	20.80
2	pH	-	6.5 - 8.0	6.5-8.5	7.60	8.00	7.4	7.4
3	Taste	-	NS	Nil	Has taste	Slight taste	Has taste	Slight taste
4	Appearance	-	NS	Nil	Turbid	Turbid	Turbid	Turbid
5	Odour	-	NS	Nil	Has odour	Has odour	Has odour	Has odour
6	Total Dissolved Solids	mg/L	2100	500	53.00	61.00	318.00	366.00
7	Conductivity	µS/Cm	1000 µS/Cm	1500	116.60	134.20	699.60	805.20
8	Total hardness	mg/L	NS	120-180	44.00	120.00	160.00	40.00
9	Chloride	mg/L	NS	250	21.30	24.14	123.54	139.16
10	Fluoride	mg/L	NS	2.0	2.12	0.14	0.14	0.15
11	Sodium	mg/L	10	20	4.46	6.27	7.15	7.41
12	Potassium	mg/L	NS	NS	14.23	17.56	2.01	1.93
13	Sulphate	mg/L	250	250	30.11	41.13	86.96	67.26
14	Sulphide	mg/L	NS	0.2	0.19	0.21	4.21	0.22
15	Ammonia	mg/L	NS	1.5	2.13	0.13	2.16	0.13
16	Nitrate	mg/L	50	10	52.00	62.00	51.30	68.00
17	Phosphate	mg/L	5	5	6.22	6.43	6.55	5.28
18	DO	mg/L	6	6	5.22	5.20	4.40	3.28
19	BOD	mg/L	6	6	27.20	11.2	22.40	19.20
20	COD	mg/L	30	NS	90.40	37.6	72.8	64.00
21	Chromium	mg/L	0.1	0.03	1.00	0.18	Bdl	0.06
22	Copper	mg/L	3	2	Bdl	Bdl	0.01	0.02
23	Iron	mg/L	1	0.3	3.18	9.53	0.49	0.73
24	Zinc	mg/L	< 1	0.01	0.06	0.09	0.03	0.06
25	Lead	mg/L	0.1	0.01	Bdl	Bdl	Bdl	0.25
26	Nickel	mg/L	0.1	0.2	0.31	0.41	0.21	0.62
27	Manganese	mg/L	0.01	0.02	0.06	0.16	0.13	0.06
28	Silver (Ag ⁺)	mg/L	< 1	0.10	0.09	Bdl	0.06	0.11
29	Calcium	mg/L	NS	NS	96.00	96.00	102.00	28.00
30	Magnesium	mg/L	NS	NS	24.00	24.00	58.00	12.00
31	Total Alkalinity	mg/L	NS	NS	224.00	176.00	504.00	528.00
32	Hydroxide	mg/L	NS	NS	Nil	Nil	Nil	Nil
33	Bicarbonate	mg/L	NS	NS	52.00	56.20	22.00	16.20
Microbial Analysis								
34	E-Coli	cfu/mL	0	0	3.0 x 10 ¹	1.0 x 10	5.0 x 10	1.0 x 10
35	Total Coliform	cfu/mL	0	0	4.0 x10 ²	8.0 x 10 ¹	1.2 x 10 ²	9.0 x 10 ²
36	Total viable counts	cfu/mL	NS	NS	2.6 x 10 ⁵	1.6 x 10 ⁵	1.8 x 10 ⁵	1.7 x 10 ⁵

Table 3.7: Baseline Groundwater Quality Analysis for Malumfashi Site

S/N	PARAMETERS TESTED	UNITS	NESREA/ FMENV LIMITS	WHO LIMITS	ANALYTICAL RESULT
					GW
1	Temperature	° C	40	32-34	20.80
2	pH	-	6.5 - 8.0	6.5-8.5	7.3
3	Taste	-	NS	Nil	Has taste
4	Appearance	-	NS	Nil	Turbid
5	Odour	-	NS	Nil	Has odour
6	Total Dissolved Solids	mg/l	2100	500	85.00
7	Conductivity	µS/Cm	1000µS/Cm	1500	187.00
8	Total hardness	mg/l	NS	120-180	56.00
9	Chloride	mg/l	NS	250	123.54
10	Fluoride	mg/l	NS	2.0	Nil
11	Sodium	mg/l	10	20	5.26
12	Potassium	mg/l	NS	NS	16.39
13	Sulphate	mg/l	250	250	41.13
14	Sulphide	mg/l	NS	0.2	0.10
15	Ammonia	mg/l	NS	1.5	0.01
16	Nitrate	mg/l	50	10	8.52
17	Phosphate	mg/l	5	5	0.05
18	DO	mg/l	6	6	6.10
19	BOD	mg/l	6	6	8.00
20	COD	mg/l	30	NS	26.4
21	Chromium	mg/l	0.1	0.03	0.06
22	Copper	mg/l	3	2	Bdl
23	Iron	mg/l	1	0.3	0.24
24	Zinc	mg/l	< 1	0.01	0.06
25	Lead	mg/l	0.1	0.01	Bdl
26	Nickel	mg/l	0.1	0.2	0.72
27	Manganese	mg/l	0.01	0.02	0.06
28	Silver (Ag ⁺)	mg/l	< 1	0.10	0.06
29	Calcium	mg/l	NS	NS	39.00
30	Magnesium	mg/l	NS	NS	17.00
31	Total Alkalinity	mg/l	NS	NS	56.00
32	Hydroxide	mg/l	NS		Nil
33	Bicarbonate	mg/l	NS	NS	22.40
Microbial Analysis					
34	E-Coli	cfu/ml	0	0	0
35	Total Coliform M.agar	cfu/ml	0	0	1.0 x 10 ⁰
36	Total viable counts	cfu/ml	NS	NS	2.4 x 10 ²

3.3.1.3 Air Quality

Air quality assessment was carried out at several locations along the Malumfashi drainage corridor where active construction operations are anticipated and where human activities are expected to be high. Samples were collected using the Dragner CMS Gas Analyzer. Ambient air was drawn into the calibrated equipment at the targeted locations and subsequently the digital readings for the various parameters were read off the instrument. The location coordinates for each sampling location are also given. The parameters

measured as part of the air quality assessment included carbon monoxide (CO), Ammonia (NH₃), Hydrogen Sulphide (H₂S), Sulphur Dioxide (SO₂), Nitrogen Oxides (NO_x), Volatile Organic Carbon (VOC) as well as suspended particulate matter (SPM). The baseline analytical results of the air pollution indicators within and around the project corridor are shown in Table 3.8.

Table 3.8: Baseline Air Quality Analysis for Malumfashi Site

S/N	PARAMETERS TESTED	UNITS	NESREA/FMENV LIMITS	ANALYTICAL RESULTS				
				AS1	AS2	AS3	AS4	AS5
1	Hydrogen Sulphide (H ₂ S)	Mg/Nm ³	5	0	1	1.00	1.00	2.00
2	Carbon monoxide (CO)	Mg/Nm ³	500	0	0	1.00	1.00	0
3	Nitric Oxide (NO)	Mg/Nm ³	300	6.24	6.35	6.25	6.25	6.25
4	Nitric dioxide (NO ₂)	Mg/Nm ³	300	1.37	1.26	1.37	1.35	1.39
5	Sulphur dioxide	Mg/Nm ³	500	1.13	1.12	1.16	1.15	1.13
6	Hydrogen Cyanide (HCN)	Mg/Nm ³	NS	3.75	2.99	3.72	3.75	3.75
7	Ammonia (NH ₃)	Mg/Nm ³	NS	3.13	3.12	3.14	3.14	3.13
8	Oxygen	Mg/Nm ³	NS	20.80	20.80	20.80	20.80	20.80

3.3.1.4 Noise and Vibration:

The Malumfashi project area runs generally along several areas of high density residential neighborhoods. Noise levels were measured using the Digital Sound Level Meter (BAFX Products), Type BAFX3370. Ambient noise exposure levels were taken at five locations along the drainage corridor. The recorded minimum and maximum ambient levels ranged from 49.2dB to 85.9dB. These noise levels may be considered moderate ambient levels but are below the FMEnv regulatory standard of 90dB. The baseline noise levels are shown in Table 3.9.

Table 3.9: Malumfashi Project Site Noise Readings

S/N	NOISE READING LOCATIONS	MINIMUM (dB)	MAXIMUM (dB)	COORDINATES
1.	DANRIMI BYPASS	49.2	70.6	N11 ^o 47.610; E007 ^o 18.989
2.	MALUMFASHI BYPASS BESIDE GGGs	54.2	87.5	N11 ^o 31.186; E007 ^o 19.012
3.	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	62.1	76.8	N11 ^o 33.319; E007 ^o 18.667
4.	FAIMASA BRIDGE	56.7	82.1	N11 ^o 33.169; E007 ^o 17.257
5.	RAFIN DINYA	55.0	85.9	N11 ^o 47.283; E007 ^o 36.317

3.3.5 Evaluation of Baseline Analytical Results

Soil Condition

Environmental contaminants in soil generally can be of concern to human health. Heavy metals are a class of elements that include lead, copper, arsenic, and cadmium, and can be toxic to humans and plants if ingested in high enough quantities. Soils have often been the landing spot for heavy metals, chemicals, and wastes as byproducts of industrial and agricultural pollutants. Many of these metals are present in soils naturally, usually in small amounts, although the natural level may vary. (Saunders & Buob, 2018).

Lead poses the greatest concern because it is the most common contaminant and is most likely to exceed health based guidance values in the United States (McBride et al., 2014). Lead does not degrade and can remain in the soil for thousands of years. Lead accumulates on the top 1-2 inches of the soil as it binds tightly to soil particles and organic matter. In addition to lead, cadmium and mercury are the most likely to pose the greatest health risk to humans. Elevated levels of copper, nickel, and zinc can cause plant toxicity, while cadmium and arsenic can be of concern to human health.

The Malumfashi project location is considered high density population communities. People, particularly children will likely to go to or wander into the construction zones thus increasing exposures to the health hazards associated with dusts and emissions from equipment and vehicles.

It is envisaged that during project implementation, construction activities such as soil excavation, stockpiling and haulage of soil materials, equipment and vehicular movements will all result in site soil dusts. These activities will essentially increase exposure of and bring residents, workers, passersby in contact with soil as well as inhalation of dusts.

Baseline soil parameters indicate the state of soil ecosystem characteristics, which especially reflect productive, buffering, filtering and other soil functions. Soil quality is significantly affected by physical, chemical, biological and biochemical properties sensitive to changes in the environment and land management. The analytical results of the baseline soil quality indicators show concentrations of key soil quality below the regulatory threshold limits.

Surface and Groundwater Quality

Contaminants in surface or groundwater which are relied upon as drinking water source by communities pose serious health risks to the residents. People can suffer acute or chronic health effects from almost any contaminant if they are exposed to extraordinarily high levels (as in the case of a spill). In drinking water, microbes, such as bacteria and viruses, are the contaminants with the greatest chance of reaching levels high enough to cause acute health effects.

The surface and groundwater conditions at the Malumfashi site were assessed through laboratory analysis of parameters that affect the quality of water in the environment. Physical properties of water quality include temperature and turbidity. Chemical characteristics involve parameters such as pH and dissolved oxygen. Biological indicators of water quality include algae and phytoplankton. The analytical results of the baseline water quality indicators within and around the project areas show concentrations that are either below the regulatory threshold limits or are

considered not significant.

Based on the results of the analytical results obtained for all the surface and groundwater samples collected from Funtua, the surface and groundwater conditions at the project site are within environmentally acceptable quality limits. All results are below the FME_{env}. and NESREA regulatory guideline limits.

Air Quality

Air pollution is a major environmental risk to health. By reducing air pollution levels, people can reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. The lower the levels of air pollution, the better the cardiovascular and respiratory health of the population will be, both long- and short-term. The WHO Air Quality Guidelines (Global Update 2005) provide an assessment of health effects of air pollution and thresholds for health-harmful pollution levels. The Guidelines apply worldwide and are based on expert evaluation of current scientific evidence.

Air quality assessment was carried out at several locations where active construction operations are anticipated and where human activities are expected to be high. The analytical results of the baseline air quality indicators within and around the Malumfashi project corridors show concentrations below the regulatory threshold limits. Field (in-situ) air sampling was carried out using the Dragner CMS Gas Analyzer. Ambient air was drawn into the calibrated equipment at the targeted locations and subsequently the digital readings for the various parameters were read off the instrument. Analytical results obtained were reviewed against the appropriate regulatory limits to determine any potential health risk levels.

Noise and Vibration

The regulatory threshold limit for noise is 90 dB. All noise readings obtained at the various Malumfashi locations with the project area are below this regulatory limit. During the project construction phase, it is typically expected that noise levels will increase from the use of heavy equipment and project vehicular movements at the sites.

CHAPTER 4: SOCIO-ECONOMIC CHARACTERISTICS AND CONSULTATION WITH STAKEHOLDERS

4.1 Description of Socioeconomic Environment

4.1.1 Introduction:

The overall project study was based on both quantitative data and qualitative inputs collected through research of historical environmental and social data for the Malumfashi, project area, and the census/socio-economic survey data (the census questionnaire and socio-economic survey questionnaire was integrated into one basic document to enhance effectiveness). Qualitative inputs through consultations and discussions with potential project affected persons (PAPs), local community members and other stakeholders provided additional information for inclusion in the assessment. The affected communities in Malumfashi, have been mobilized to contribute actively to project implementation and to sustainably maintain the works following implementation.

The socioeconomic elements and characteristics of the subproject areas considered in this study include population, land use and tenure system, social setups, economic activities, education, vulnerability profile, gender, religion, settlement and migration patterns and health services system for Malumfashi Communities. Qualitative and quantitative mixed method of assessment was adopted in this project because it offered an effective means of interacting widely with the stakeholder groups, the Katsina NEWMAP team, as well as individual stakeholders and affected persons. Participatory community meetings, public discussions as well as discussions with key informants (Community elders, Local leadership, and Katsina NEWMAP Officers, among others) were held in the course of study.

4.1.2 Socio-economic Study

An integrated census and socio-economic survey questionnaire was developed and administered to the project area communities particularly households that may be affected directly or indirectly by the project. The questionnaire was administered to provide socio-economic profile of the community, particularly the areas that will potentially be impacted by the project. The census included data on age, gender, occupation, income, sources of livelihood of all persons who live on or derive a living from the area of land as well as information on houses, businesses and any structures in use in the affected areas. The specimen of the census/socio-economic survey forms adopted for the project areas is included as Annexure II.

Besides the quantitative data collection method, a number of other tools were also used for eliciting information. These tools included Focused Group Discussion (FGD); Community meetings and Key informants' interviews.

Essentially, the comprehensive questionnaire for data collection that was used captured the following information:

- a) Household bio-data (demographic information);
- b) Livelihoods;
- c) Inventory of structural and nonstructural assets including land, common properties, houses, economic trees and cash crops.

4.1.3 Public/Stakeholder Consultation:

This was conducted as part of the participatory approach aimed at gaining good knowledge of the social issues/risks associated with the projects as perceived by the communities. Public meetings were held at the respective community facilities located within the project immediate impact areas. Table 4.1 show a matrix of the meetings held with the Malumfashi communities and the locations where the meetings, socioeconomic/census documentations were held within the project communities. Minutes of and attendance to the meetings are included in Annexure V - VIII.

Table 4.1: Schedule of Community/Stakeholder Meetings and Socioeconomic Documentation

DISTRICT/ COMMUNITY	TYPE OF MEETING	LOCATION	DATE(S) HELD	NO OF ATTENDEES
MALUMFASI DISTRICT COMMUNITIES	Community Leadership Consultation	Malumfashi District Head Palace	July 28, 2019	18
	Community Sensitization	Community Square at Kofar Fada	July 29, 2019	36
	Focal Group Discussions (Men, Women and Youth)	Community Square at Kofar Fada	July 29, 2019	Men-26 Women-31 Youth-13
	Socioeconomic/Census Documentation	Community Square at Kofar Fada	July 30-31, 2019	166
COMBINED FMKJ DISTRICTS	Stakeholders Meeting	State Secretariat Chamber, Katsina	Aug 7, 2019	70

4.1.4 Use of Maps and GIS:

Survey maps as well as high resolution Digitalglobe Quickbird imageries (2019) were used to identify and map out the project areas identifying any locations of structures relative to the project corridors.

The qualitative analysis involved an assessment of information obtained during the stakeholders' consultations and public participation forums and discussions. The socioeconomic study provided necessary primary quantitative data for each project assessment. This quantitative data included:

- Household census of the people within the respective project areas;
- Establishing the socioeconomic profile of each project area population including health related status of respondents;
- Establishing the structural assets to be affected by each project;
- Establishing the area of land to be affected by each project.

4.2 Description of Cultural Environment

4.2.1 Population

Based on the 2006 national population census records and the 3.04% annual population growth factor recommended by the national population commission (NPC), Malumfashi LGA have projected populations 261,977; for 2018.

4.2.2 Ethnic Groups

The people of Malumfashi consist of one of Nigeria's major ethnic groups – the Hausa/Fulanis. The ethnic group has its unique culture, social organization and traditions. The social and cultural aspects in the project area are closely intertwined

with the ethnic groupings. The Fulanis have elaborate cultural practices that include strong kinship linkages with organizations spanning from localized social groups to strong clan relations. The cultural associations and social interactions are epitomized during cultural and religious ceremonies and festivities.

Malumfashi town is essentially an urban centers whose residents are generally trading, commercial and agricultural men and women. The local dwellers rear domestic animals such as goats and sheep, and maintain farms lands most of which are cultivated with groundnut, maize, potato and millet. Each District village traces its origin from genealogical ties. Politics in the town are done within the framework of clanism. Clans are the basic point of cultural and political identity for the citizens. Clanism and kinship are the elemental forces in control of political and cultural institutions as well as service points. As previously stated, the project areas is significantly urban.

4.2.3 Religion

The people of Malumfashi, town are mostly of Islam religion (Muslims). A very small fraction of the population is of the Christian or other faith.

4.3 Land Use Pattern

There are three major types of customary land tenure system in the project area – (1) individual land ownership; (2) family land ownership; and. (3) communal land ownership. Individual ownership may be for indigenes or for residents of the community. Family lands (as well as individual lands) are inherited from generational relatives. Communities retain family lands which may never be sold. Such family lands are generally retained for communal development and sometimes are rotationally shared among the members of the community for agricultural purposes but are not for sale.

The Malumfashi project area can be characterized as a predominantly rural setting with residential and agricultural properties occupying most sections of the communities and land areas. Over 60% of the land use in project areas is committed to agricultural production of food crops. The crops include rice, onions, garlic, maize, millet, groundnuts, tomatoes, potatoes, wheat, sorghum, guineacorn, vegetables, etc.

4.3.1 Cultural Resources

There are no known designated historical or archaeological resources within the project areas. However, there may be the existence of several burial grounds & other cultural relics within and in close proximity to the project areas. This ESMP spells out appropriate site specific mitigation measures for any burial ground and other cultural relics that maybe found during the project implementation.

4.4 Analysis of Socioeconomic Survey

The measurement of precise impacts of the project on persons living or earning their living within the project areas cannot be effectively established without appropriate and accurate social and economic baseline data. The socioeconomic study helps to assess the social and economic changes that may occur in the living conditions of the project area populations as a result of the project impacts.

4.4.1 Objectives of the Socioeconomic Survey

The primary objectives of the socioeconomic survey are as follows:

1. To collect information regarding existing socioeconomic conditions of the Malumfashi project area population;
2. To use the collected socioeconomic information to develop baseline data for the assessment of the social and economic impacts of the projects;
3. To analyze the patterns of relationships that exist among various socioeconomic or demographic components of the project areas;
4. To obtain perceived views of respondents on the effects of the projects on the environment and their vulnerability to socioeconomic changes due to the projects; and,
5. To provide a benchmark for any further information needed to monitor and evaluate improvements in the future.

The respondents to the socioeconomic survey included the following:

- (1) Owners of any buildings or structures located within 10 meters from the outermost edges of the Malumfashi drainage corridors;
- (2) Owners of any buildings or structures located in areas to be used as construction staging areas during the construction phase of the projects;
- (3) Residents/tenants of the buildings or structures identified in items (1) and (2) above whether the structures are permanent or temporary; residential or commercial;
- (4) Land owners within the proposed drainage rehabilitation areas whose lands would be required for the purpose of the projects;
- (5) Economic trees/crops owners within the drainage setbacks whose lands would be required for the rehabilitation purposes.

The socioeconomic survey was conducted in conjunction with the census of the project affected persons to profile the impacted project area and provide baseline data against which mitigations measures and support will be measured. The analysis is based on respondents to the questionnaire administered to residents of Malumfashi communities who are most likely to be impacted by the project. On the basis of the responses obtained in the exercise, the following determinations are made.

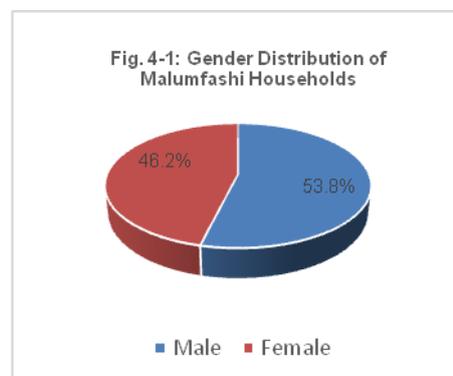
4.4.2 Malumfashi Socioeconomic Survey

4.4.2.1 Respondent and Household Distribution in Project Area

The following Sections show how the residents of the project area responded to the socioeconomic survey administered to them. A total of 166 questionnaires were administered to potential PAPs within the project communities with a 100% return. Based on the survey, the 166 respondents with 1106 household members were documented for Malumfashi Districts.

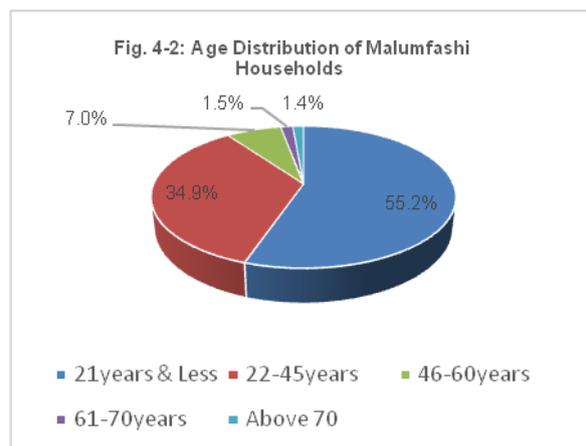
4.4.2.2 Gender, Age and Household Size Distribution

The survey data indicated male/female distribution of 46.2/53.8% for households in Malumfashi. The household data is reflected in Figure 4-1.

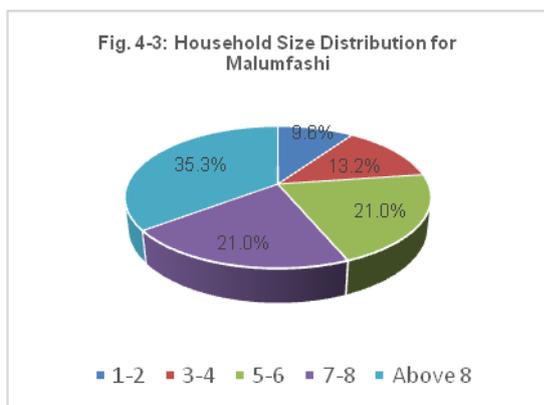


Men and women in the project area are generally mainly involved in farming. Both men and women are significantly involved in the general pursuits of livelihoods.

The age distribution data (Figure 4-2) indicated that the percentage of household members 21 years of age and below for Malumfashi project area is 55.2%. About 2.9% of the households are in their 60s and above. The survey further showed that 34.9% are within the youthful ages of between 22 and 45 years while 7.0% of the household members are between the ages of 46 and 60 years. There is strikingly a high percentage of children below 21 years in the households (Figure 4-2).



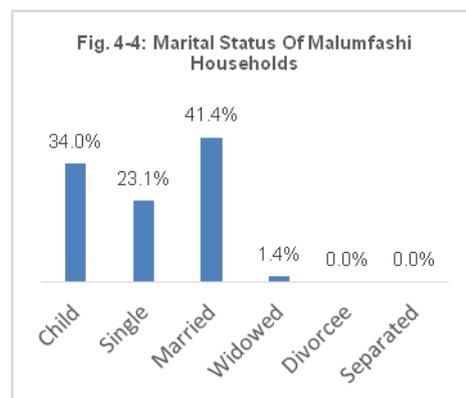
The household size distribution from the survey ranged from a minimum of one person to a maximum of 19 persons in Malumfashi. The average size of households is 6 persons for the project area community. On the extreme household size ends, the project area has 9.6% of the households with one to two members and 35.3% of the households with more than 8 persons (Figure 4-3). About 21.0% of the households have sizes of 7 or 8 persons while 21.0% showed sizes of 5 or 6 persons. The data showed 13.2% households have sizes of between 3 and 4 persons.



persons.

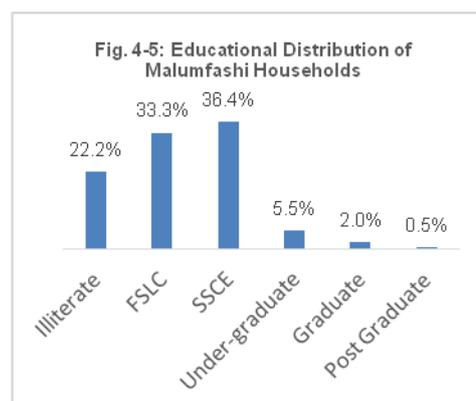
4.4.2.3 Marital Status of Respondents

The survey data showed that 41.4% of respondents in the project area are married, 34.0% are children of non-marriageable age, 23.1% are single and 1.4% widowed. (Figure 4-4)



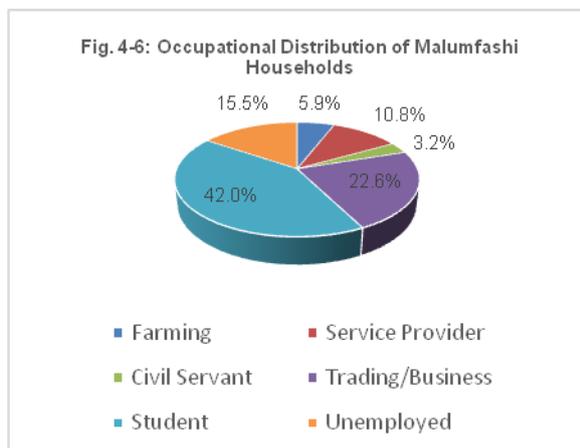
4.4.2.4 Access to Education

The survey responses indicated that in the project community, the population of schooling age who never attended school is 22.2%; 33.3% had basic primary school education (FSLC), 36.4% attended Secondary school (SSCE), 5.5% are Undergraduates, 2.0% are Graduates and 0.5% had a Post-Graduate degree. (Figure 4-5). The very low literacy level within the project affected area is reflected in the significantly low number of existing educational infrastructure support within the area.



4.4.2.5 Access to Health Infrastructure

The common diseases in Malumfashi communities include diarrhea, malaria, typhoid, pneumonia, cough, skin diseases, deficiency diseases, eye diseases, ear diseases, and waterborne diseases resulting mainly from malnutrition and lack of hygiene. Due to poverty, the quality of the health care services in the areas is generally poor with most residents patronizing quacks and medicine shops for their medical treatment. It should be anticipated that there will be increased pressure in the demand for health facilities in the communities resulting from influx of persons during the implementation of this project.



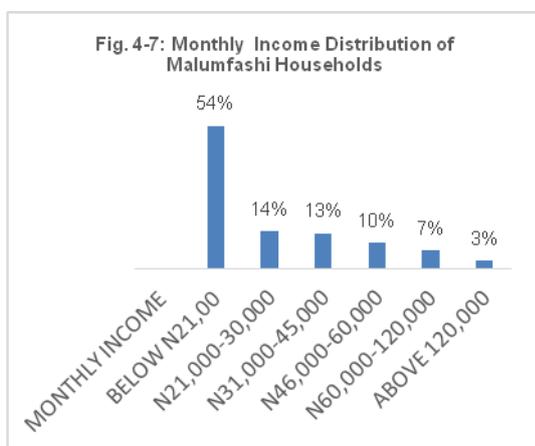
4.4.2.6 Access to Socioeconomic Infrastructure

The socioeconomic infrastructures (roads system, electric power and access to water) in the Malumfashi project area are generally in poor state. Public access to potable water is non-existent and power is generally not steady. Implementation of the Malumfashi project will result in an influx of persons seeking gainful employment with the project contractors or to gain any social privileges within the

project communities. It should be anticipated that there will be increased pressure in the demand for social infrastructures and amenities in the communities resulting from influx of persons during the implementation of the project. The influx of persons will inevitably put pressures on existing social service resources like water, electricity, transportation, etc. in the communities. The use of existing facilities will be on the rise.

4.4.2.7 Occupational and Income Distribution of Respondents

The occupational distribution data from the questionnaires indicated that of surveyed households in the Malumfashi project area, 5.9% are farmers, about 33.4% are employed in the private sector, 3.2% are civil servants, 42.0% are students and 15.5% are unemployed (Figure 4-6). The main source of income for the households surveyed came from farming and trading/business across the community.



Based on the income data provided in Malumfashi, 54% earned less than N21,000 monthly, 14% earned between N21,000-30,000 monthly, 13% earned N31,000-45,000 monthly, 10% earned N46,000-60,000 monthly, 10% earned above N60,000 monthly (Figure 4-7). The margin of error in the information provided on incomes may be significant considering that some of the respondents may have grossly inflated data provided with the intent to receive compensations in accordance with incomes indicated in the survey. The data provided

could not be independently verified.

4.4.2.8 Household Waste Disposal

Most of the respondents in the communities indicate that their household wastes are disposed of at convenient locations including crevices and drainage channels. In many areas, the wastes are also indiscriminately dumped inside the water canals or at illegal dumpsites created only as a matter of convenience. Solid waste management in the project areas is a considerable hazard to the health of the population and the effective functioning of the storm water drainage systems. The unmanaged refuse causes regular obstruction of the storm water drainage systems.

Most residents in the project communities dispose their domestic refuse randomly outside their residential compounds and the flood-prone areas are also treated as de facto waste disposal sites. The situation in the communities are indeed a reflection of the poor waste management and waste disposal mechanisms in most part of the state. As with other parts of the country, majority of households typically dispose of their domestic refuse inappropriately outside their residences. During the wet season, solid waste is transported by flowing storm water through unplanned drainage paths leaving a trail of refuse.

4.4.2.9 Desirability of the Project

All the respondents in the survey (100%) indicated immense desirability for the project to proceed. Many of them expressed a clear wish for the project to proceed before the next round of rainfall.

4.4.2.10 Potential Security Risk Challenges

As severally indicated, implementation of the Malumfashi project will result in an influx of persons seeking gainful employment with the project contractors or providing social services of various types or to gain any social preivilages within the project communities. Different types of persons, including criminals of sorts, may be expected to find their ways into the project communities within this time. Such movement of persons will inevitably increase the potential for criminal activities within the Malumfashi project communities. It should therefore be anticipated that there will be increased pressure in the demand for police services and other security issues in the project area. Additionally, the cumulative unemployment levels in Malumfashi town resulting from the influx of employment seeking persons to the area will pose its own security risks for both the communities and the security institutions.

4.4.2.11 Conflict Resolution

All respondents in the survey (100%) prefer and find it most convenient to have conflicts resolved through informal traditional modes of conflict resolution which currently exist within the communities. The court system is seen as an alternative means to resolve issues but no respondent favored it as a means of resolving conflict. None of the respondents was indifferent to the preferred approach.

4.5 Public/Stakeholders' Consultation and Participation

The public participation process is a critical component of this ESMP development and required identifying and working with all stakeholders and the project communities, including potentially affected individuals or group of persons, from the beginning of the process. The direct involvement and active participation of relevant stakeholders and the local people in the planning and management processes of the project assures that any potential disharmonious issues within the community are resolved speedily. There will also be maximization of resource use and increased benefits and expanded opportunities for the communities in the project areas.

The consultation process with the people of, Malumfashi, was driven in a manner that encouraged active and sustained participation of the community members, particularly the project area communities. This was to promote community ownership of the project and to enhance sustainability. Consultations and stakeholder involvement in the project gave the villages and the potentially PAPs the opportunity to make contributions aimed at strengthening the project while avoiding any negative impacts and reducing possible conflicts. The consultations will remain an ongoing exercise throughout the entire project to minimize chances of possible conflicts. This phase also involved the administration of pre-defined socio-economic questionnaires at the household level for potentially affected areas along the drainage corridor.

4.5.1 Community Participation

Community participation improves understanding of the project and communication between the SPMU, the consultants or contractors and the community. The decision-making process for the projects will also be enhanced by actively involving relevant stakeholders, especially the project affected persons and organizations with a stake in the projects.

4.5.2 Objectives of the Community Consultations

The aims of the public participation and consultation process are:

- Solicit inputs, views and concerns from the affected community as they relate to the project and obtain local and traditional knowledge that may be useful for decision-making;
- Facilitate consideration of alternatives, mitigation measures and trade-offs, and ensure that important impacts are not overlooked and that benefits are maximized;
- Reduce conflict through the early identification of contentious issues; and increase public confidence in the project.
- Provide opportunity for the public to influence the project designs and implementation in a positive manner and improve transparency and accountability in decision-making.

4.5.3 Public Consultation Methodology

The methodology adopted in this ESMP for carrying out the consultation process include a qualitative and quantitative mixed method that offers an effective means to interact widely with the project communities and stakeholder groups. Essentially, the approach is based on a participatory approach that included community meetings, public discussions as well as discussions with key informants (District Head, Village Heads, Council members, Local Authorities, and Katsina NEWMAP Officers among others). A brief description of these methods is as follows:

1. Rapid Assessment Technique:
This involved a quick professional assessment of the project potential impacts based on nearness of residential/commercial assets to the drainage corridors, anticipated nature and intensity of impacts, and the significance of the impacts within the proposed project area. Any affected property owner is directly engaged in discussions to create and gain better understanding between the parties.
2. Socioeconomic Survey:
This involved the administration of structured questionnaire designed to provide socioeconomic profile of households/families resident or doing

business within the project area as well as formal and informal discussions with focus groups, including the community traditional and administrative leadership.

3. Public Meetings:

This was conducted as part of the participatory approach aimed at gaining good knowledge of the social issues/risks associated with the project as perceived by the communities. Public meetings were held at different locations within the project immediate impact areas.

4.5.4 Stakeholders’ Identification

Generally, five broad categories of stakeholders were identified by the study based on the degree to which the project activities affected or involved such persons or group of persons. The five groups of stakeholders were actively consulted and encouraged to participate in the project development process. These stakeholders are grouped as shown in Table 4-2.

These individuals and groups of persons include those who live in close proximity to the drainage corridor; those who will hear, smell or see the development; those who may be forced to temporarily relocate because of the project; those who have interest either traditionally or administratively, over developmental activities or policy changes for the project area (they may or may not live in proximity of the project); and, those who infrequently use the land on which the project is located.

The adopted process consists of:

- i) Identification of any parties whose line of duties whether officially, socially, economically or culturally have direct or indirect bearing on any aspects of project activities. These parties may include individuals, groups, institutions or organizations that may be affected by the drainage rehabilitation activities;
- ii) Establishment of the stakeholders list and identification of specific stakeholder interests in relation to the project. The issues considered include: (a) the project's benefit(s) to the stakeholders; (b) potential changes to the routine activities of the stakeholders that may occur due to the project; and, (c) the project activities that may cause damage or conflict for the stakeholder;

Table 4-2: Identified Stakeholder Groups

GROUP	DESCRIPTION	ROLE(S) IN COMMUNITY PROCESS
Group-1	Individuals or group of persons whose day-to-day lives/livelihoods may be directly affected by project activities. These are people who either reside or carry out their day livelihood activities within the Drainage corridor plus 20meters from the drainage corridor.	The identified persons or group of persons in this category will ultimately represent the project potentially-affected persons (PAPs) or households (PAHs)
Group-2	Individuals or group of persons whose day-to-day traditional or administrative functions include oversight of developmental activities within the project areas.	This category of persons serves as mobilization points around which the Consultant will reach out to the other members of the community.
Group-3	Individuals or group of persons whose daily activities (including farming) bring them in close proximity to the project area. These are people who either reside or carry out their daily livelihood activities outside the channelization corridor but within the communities in which the project is located.	This category of persons may or may not be affected by the project but may be significant contributors to the long term sustainability of the project.

GROUP	DESCRIPTION	ROLE(S) IN COMMUNITY PROCESS
Group-4	CBOs, FBOs and NGOs who provide frequent interface with the community members who may be directly or indirectly affected by the project activities.	This group of organizations essentially provides on a continuous basis spiritual and physical welfare as well as environmental health of the community.
Group-5	Individuals or group of persons who are political office holders and have significant responsibilities toward community members and developments within the project areas.	This group of individuals is collectively responsible for the political and general socio-economic development of the community, among others within their respective political zones.

4.5.5 Malumfashi Community Meetings

The ESMP Consultant team met with Malumfashi community groups between July 28 and August 7, 2019 to gain knowledge of the community perspective on the issues associated with the stormwater drainage in their respective communities. The initial community meetings were facilitated by the SPMU and were held at the Palace of the District Heads. Attendance to the meetings included the District Head as well as the various Village Heads.

At each of the community meetings, the ESMP Principal Consultant explained the purpose of the meeting and formally introduced members of the study team to the communities. He further provided an overview of the ESMP as related to the Malumfashi projects and also highlighted the objectives, activities, outputs and work schedule of the assignment. He called upon the community members to render sustained support by providing any necessary information/data to the Consultant and also to other Consultants or Contractors that may be associated with the project implementation. Thereafter, the Consultant called for questions, comments, observations or suggestions from the respective communities to which answers and necessary responses were provided. Summaries of the minutes of each of the community meetings and the list of participants are provided in Annex V - VIII.

The meetings with the enlarged communities were held within the project corridor villages and within the respective assembly grounds for the communities. The community meetings for Malumfashi, communities were attended by 36 persons, including the principal community leaders and members of the communities. A wider stakeholders' meeting for the projects was held on August 7, 2019. This meeting which held in Katsina involved the direct participation of all those individuals and groups of persons identified in Table 2.1. Additionally, focus group discussions (FGD) with the men, women and youths of each of the Malumfashi communities were held between July 29 and July 31, 2019.

4.5.6 Participants' Feedback and Comments

During the Malumfashi, community meetings, the District Heads expressed the appreciation and gratitude of the community to NEWMAP, the Katsina State Government, the Federal Government and the World Bank for the proposed intervention works. Several other participants expressed their views, and made comments and suggestions relative to the project. All the speakers promised to give full cooperation and support to the activities of the Consultant and their respective projects. Photos taken at the various community meetings are included in Annex V - VIII.

Consultations and stakeholder involvement in the projects will continue in a manner

that gives the communities and the project affected persons (PAPs) the opportunity to make contributions aimed at strengthening the development project while avoiding negative impacts as well as reducing possible conflicts. The consultations will also remain an ongoing exercise throughout the entire project, particularly with the potentially affected individuals and households relating to resettlements and compensations to minimize chances of every possible conflict.

Information and data gathering involved a broad spectrum of activities that included interviews and discussions with community members who have historical knowledge of the site and the history of flooding and erosion problems in the affected areas. It also involved other physical and intrusive study of the natural, social, economic and cultural environments of the project areas.

Table 4-3 gives the list of identified stakeholders with their areas of interest and responsibilities in the project. The list includes government functionaries, NGOs, FBOs and CBOs among others.

Table 4-3: List of Stakeholders and Their Responsibilities

GROUPS	IDENTIFIED STAKEHOLDER	AREA OF INTEREST IN PROJECT
Group-1	Residents of Malumfashi, Communities, particularly those that reside within the project corridors	PAPs/PAHs
Group-2	Office of the Community Association Chairmn for the affected communities.	Development and welfare of the respective Communities
Group-3	Persons who reside outside the project Communities, but have businesses or means of livelihoods within the project areas	Individualized livelihood issues
Group-4	Community-based Organizations	Watershed protection and management
	Faith-based Organizations in the Communities	Community spiritual and physical welfare
	Non-governmental Organizations	Protection of environmental health of communities
Group-5	Office of the Chairman – Malumfashi LGA	Development of the Malumfashi LGA
	Office of the Hon. Member – Katsina State House of Assembly representing Malumfashi,	Development of the Malumfashi, Katsina and Jibia LGA in the state constituency
	Office of the Hon. Member – Federal Constituencies representing Malumfashi	Development of Malumfashi federal constituency
	Office of the Distinguished Senator – representing Malumfashi	Development of Katsina South Senatoral Zones

CHAPTER 5: ASSESSMENT OF POTENTIAL IMPACTS AND ANALYSIS OF ALTERNATIVES

5.1 Introduction

This chapter discusses the methods/techniques used in assessing and analyzing the potential social and environmental impacts of the Malumfashi projects and, also discusses the alternatives to the proposed projects and reasons for their rejection. The likely future scenario without the project was also considered. The details of methods used in arriving at the significant potential social and environmental impacts of the project are included in Annex XXI and the impact assessment process is depicted in Figure 5.1.

The beneficial and adverse potential environmental, economic, social and cultural impacts are identified based on professional judgment and the use of unranked pair-wise comparison approach (Canter and Sadler, 1997). Other factors in predicting the potential impacts include the results of public consultations. The potentially significant environmental and social impacts of the project as well as the suitable mitigation measures are discussed.

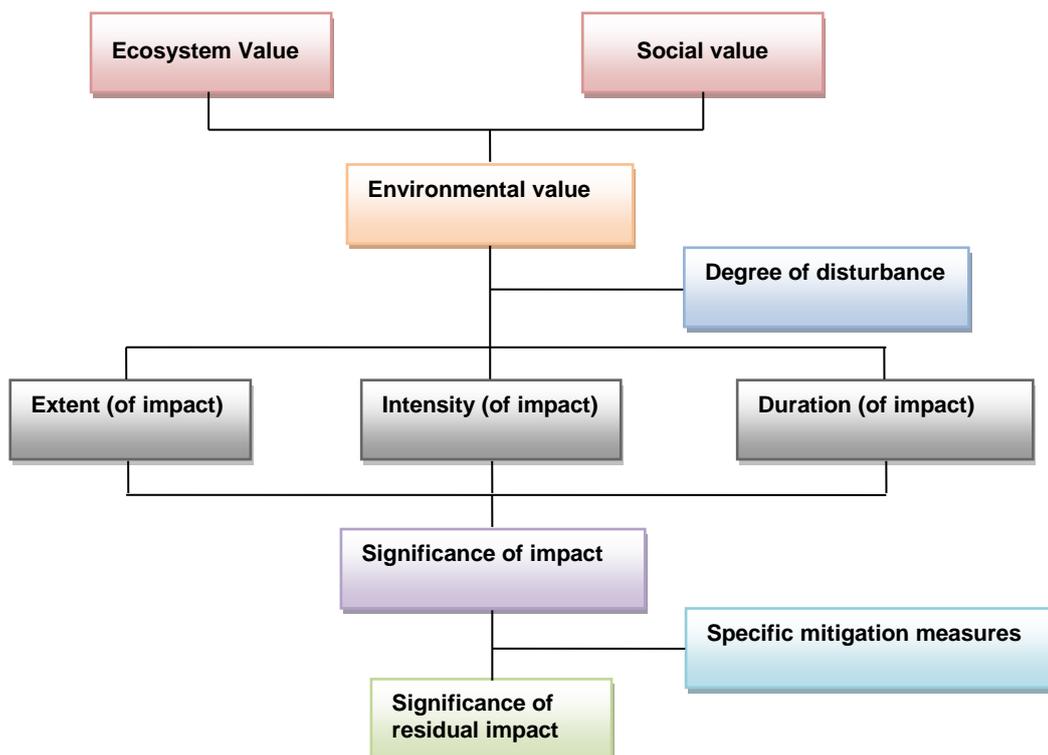


Figure 5-1 : Standard Flowchart for a Systematic Approach to Impact Assessment
(Source: OTG Consultant, 2019)

The assignment of responsibilities for implementation of the ESMP and the associated costs are presented in Chapter 6.

As previously indicated under Chapter 1, the envisaged project activities will include:

1. Civil Construction Works:
 - cutting and filling for percentage recovery
 - compaction of soils

- concrete casting
- assembling of structures
- Slope stabilization
- Digging of foundations of the lattice structures
- Vegetation clearing
- Deployment and movement of transport vehicles and power equipment
- Use of earth moving equipment such as excavators, compactors, bulldozers and pay loaders;

2. Bio-Engineering Remedial Works:

- Terracing;
- Structured vegetation;
- Specific trees planting with known root strength
- Economic trees planting

Overall, this project is aimed at halting or minimizing the environmental and social damages being caused by the incidence of flooding and soil erosion in the project area and beyond. This is, in the overall a positive impact. The envisaged areas of potential impacts (positive and negative) on the socioeconomic, cultural and biophysical environments which could result from the proposed project include:

Environmental Impact Areas:

- 1) Air quality
- 2) Surface water quality
- 3) Groundwater quality
- 4) Noise and vibrations
- 5) Degradation of arable land in the project area.
- 6) Biodiversity conservation.
- 7) Siltation of stream.
- 8) Ecological diversity in stream watershed.
- 9) Public Health and safety
- 10) Visual effects.
- 11) Traffic and transportation
- 12) Earth movements
- 13) Solid and liquid wastes
- 14) Soil erosion and flooding vulnerability
- 15) Climate change
- 16) Landscape change

Social Impact Areas:

- 1) Economic Activities:
 - Sources of livelihoods.
 - Employment generation
- 2) Damage to Infrastructure:
 - Residential & commercial buildings
 - Roads, drainages, utilities, etc.
- 3) Community Effects:
 - Displacement of persons.
 - Isolation of settlements.
 - Migration of communities.
- 4) Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA)
- 5) Damage to archaeological and cultural resources
- 6) Land use restrictions

The evaluation of the social environment requires assessment of the need for land for the projects as proposed and the remedial alternatives by conducting the following:

- Analysis of watershed to determine drainage corridors and the consequential storm water flow path resulting from anthropogenic activities within the project areas;
- Development of conceptual remedial alternatives based on the field surveys and the analysis of the watershed;
- Evaluation of the availability of land for proposed project or alternatives.

Following the collection of primary socio-economic data on the communities, a qualitative and quantitative analysis of the data was conducted to assess direct impacts on project population. Existing environmental conditions that impact on human health and safety was evaluated to ascertain imminent risks that may be associated with the projects. Specifically, analytical data on the ambient air and surface water quality was used to assess potential health risk concerns to residents within the Malumfashi project corridor

Potential environmental impacts at the Malumfashi site were developed in accordance with the grouped and project-phased impact identifiers contained in the ESMF for NEWMAP. The project phases are pre-construction, construction, and operation and maintenance phases. The potential impacts that arise from all the information/data sources identified were developed and presented in matrix/table format for the Malumfashi project.

The evaluation of the level of significance of environmental impacts was done within the current value system. The tools which were used to define the boundaries for, or regulate every intervention activity and their impacts comprise relevant laws, policies, plans, standards, objectives, limits of acceptable change, performance targets or other environmental quality goals which have a bearing on the proposed activity and its associated impacts.

In assessing the social impacts, the measureable changes in human population, communities and social relationships resulting from the intervention project were identified. The social variables were evaluated under the following general headings:

1. Population characteristics;
2. Community and institutional structures;
3. Political and social resources;
4. Individual and family changes; and,
5. Community resources.

A matrix/table relating project changes to social impact assessment variables were developed. The affected communities (villages) associated with the respective project districts are shown in Table 5.5

Table 5-5: Project Area Districts with Affected Communities/Villages

PROJECT TOWN/DISTRICT	AFFECTED VILLAGES/COMMUNITIES			
MALUMFASHI	Lambun Gangarawa	Kwamkwamawa	Gwamutsewa	Rafin Gumya

5.2 Analysis of Potential Impacts Triggered by Malumfashi Projects

The potential impacts as listed above are organized considering the critical phases of the projects from the construction phase to the operation (post-construction) phase and summarized based on whether the envisaged project impact areas will result in positive or negative impacts. Impact emphasis is placed particularly on the construction and operation phases of the project. These are summarized as shown in Table 5.6.

Table 5.6: Summary of Potential Impact (Areas Triggered by Project)

S/No	Potential Positive Impact		Potential Negative Impact	
	Impact	Aspects of Project that Trigger Impact	Impact	Aspects of Project that Trigger Impact
PROJECT CONSTRUCTION PHASE				
1	Increased value and usefulness of Affected Lands and Drainages	Rehabilitation of degraded drainage corridors and eroded lands within the project areas.	Displacement of people.	Land acquisition for right of way, etc. reasons
2	Safety of Lives and Properties	Flood and erosion control will provide needed safety to the peoples' lives and properties	Degradation of off-site land	Soil excavations for backfill materials at identified borrow pits or off-site sources.
3	Employment Generation	Site clearance, excavation, loading and offloading of materials and delivery services; drivers, security services, provision of goods and services to construction workers e.g. food kiosks and other shops.	Loss of means of livelihoods.	Loss of crop lands and economic trees along the proposed project corridors.
4	Protection to building structures.	Stabilization of existing buildings or structural assets within the project corridors during construction.	Loss of vegetation	Site clearances.
5	Gender based violence & Sexual exploitation and Abuse	Construction worker selection or determination based on gender; Subjection of women to general discrimination and work place abuse or violence or sexual exploitation.	Damage to archaeological and cultural resources	Presence of community burial grounds and other potential cultural relics in the vicinity of project areas
6	PROJECT OPERATIONS PHASE (POST-CONSTRUCTION)		Air quality/pollution	Emissions from construction vehicles, plant and equipment. Excavation and earth moving operations. Exhaust emissions from poor maintenance of plant and equipment or over revving of engines.
7	Increased community awareness and enhancement of local capacity	Active involvement of project communities in awareness campaigns and capacity building. Training of community members and local residents in health, safety and environmental awareness	Surface and ground water quality	Suspended particles releases from earthworks. Spillages of fuel and other petroleum products.

S/No	Potential Positive Impact		Potential Negative Impact	
	Impact	Aspects of Project that Trigger Impact	Impact	Aspects of Project that Trigger Impact
8	Improved knowledge on erosion and flood control	Community knowledge of causes of erosion and flooding, and capacity to prevent and control flooding and erosion throughout the watershed.	Noise and vibrations	Noise and vibrations from moving vehicles, excavators, generators, power tools, and compressors during construction.
9	Improved and Sustained infrastructure (drainages, electric poles, etc).	Maintenance of floods and erosion control infrastructure for continued effectiveness.	Public and Occupational Health and safety	Construction operations - excavations, construction traffic, stockpiled materials Recruitment of children to work on construction sites. Life in construction workers camp. Waste disposal practices, sanitation and prostitution.
10	Improved site access roadways	Rehabilitation of site access roads before and/or after construction to allow for movement of machinery and for the delivery of materials.	Visual effects.	General construction works and activities
11	Enhanced community leadership	Formation of various community committees to facilitate sustainable post-construction monitoring and maintenance.	Traffic and transportation	Traffic movements associated with site staff, delivery of materials and the removal of waste during construction
12	Improved public recreation areas through land use restrictions	Bio-remediation of erodible land and conversion for long term use as community recreation areas.	Earth movements	Construction operations due to unstable soil profiles from site excavations.
13	Restoration of vegetation and other vital trees	Replanting of vegetation cleared during construction activities	Solid and liquid wastes	Generation of waste during construction including off specification materials such as cement, wood, plastic, paper and domestic waste from construction areas and worker camps.
14	Improved flood and erosion control structures post construction	Post-construction maintenance of flood and erosion control structures and bio-remediated areas	Climate change	Exhaust emissions from construction vehicles, plant and equipment. Emissions from poorly maintained plants and equipment or over revving of engines.
15			Landscape change	Project cut and fill and soil movement along the project corridor.
16			Pressures on Off-site Resources	Sourcing of construction materials such as sand from river beds or burrow pits. Increased demand for construction materials

N/A = Not Applicable

5.3 Potential Impacts Significance Rating for Malumfashi Projects

Table 5-7 summarizes the detailed analysis of the impact significance ratings for each of the potential project impact areas for the Malumfashi stormwater drainage intervention project

Table 5-7: Significance Ratings for, Malumfashi Project Impact Area

S/No	Potential Impact Area	Consequence Rating	Probability Classification	Impact Significance
PROJECT CONSTRUCTION PHASE				
1	Loss of means of livelihood	Medium	Definite	Medium
2	Loss of physical assets	High	Definite	High
3	Displacement of persons	Medium	Definite	Medium
4	Degradation of land	Medium	Improbable	Low
5	Vegetation loss	Medium	Definite	Medium
6	Loss of archaeological and cultural resources	Medium	Definite	Medium
7	Air Quality	High	Definite	High
8	Surface/ground Water	Medium	Definite	Medium
9	Noise and Vibrations	High	Definite	High
10	Stream ecological diversity	High	Possible	Medium
11	Safety and health	High	Definite	High
12	Visual Effects	Very Low	Improbable	Insignificant
13	Traffic and transportation	Medium	Definite	Medium
14	Earth movements	Very High	Possible	Medium
15	Solid wastes	Medium	Definite	High
16	Liquid wastes	Medium	Definite	Medium
17	Climate change	Medium	Possible	Low
18	Landscape change	Medium	Definite	Medium
19	Gender Based Violence & Disparity	High	Possible	Medium
20	Off-site Resources	High	Probable	Medium
OPERATION & MAINTENANCE PHASE				
1	Damage to erosion control structures	Medium	Possible	Low
2	Site access roadways rehabilitation	High	Definite	High
3	Erosion & flood control capacity	High	Improbable	Low
4	Enhanced community leadership	Medium	Possible	Low
5	Land use restrictions	High	Definite	High

5.4 Identified Social and Environmental Impacts

The impact significance outcome of Table 5.7 indicating the social and environmental impact categories that will suffer medium to high impact levels during the Construction and Post-construction Phases of the project implementation is summarized below: The other environmental and social impact categories will suffer low to insignificant impact levels from the project as shown in the Table.

Project Construction Phase:

- Loss of means of livelihood
- Loss of physical assets
- Displacement of persons (temporary)
- Vegetation loss
- Loss of archaeological and cultural resources
- Air quality and Dust
- Surface and ground water quality
- Noise and vibration
- Stream ecological diversity
- Public/Occupational Health and Safety
- Traffic and Transport
- Earth movement (during construction and post construction phases)
- Solid wastes
- Liquid wastes
- Landscape change
- Gender based violence/Sexual abuse and exploitation
- Off-site Resources

Operation & Maintenance (Post Construction) Phase:

- Site access roadways rehabilitation
- Land use restriction

5.5 Analysis of Alternatives

The consideration of alternatives relates principally to ways of improving the proposed intervention activities and/or attempting to avoid or minimize potential significant negative impacts. Usually there are several alternatives to any project. This section discusses the alternatives to the proposed project and reasons for their rejection. For the proposed Malumfashi project, the alternatives considered include: **delayed project alternative**; **a do-nothing alternative**; and **the planned project alternative**. Under these alternatives, the various project component options were considered as they relate to each of the Malumfashi intervention project.

The project component options were considered in terms of the potentially significant impacts associated with each option to a point of clear emergence of optimum alternative. The selection of a particular alternative is premised on several considerations, including the desirability/acceptability of the project, the government's position or inclinations to the project, the potential environmental and social impacts of the project, the economic viability of the project, etc. The consideration of the options intertwined with the mitigation measures for the identified E&S impacts are shown in Table 5.8.

The "Delayed Project" Alternative implies that nothing will happen immediately or at best some palliative measures will be undertaken in the interim to ease the severe flooding and erosion occurring at the Malumfashi communities. Such palliative measures are unlikely to achieve effectiveness with the desired goals based on drawbacks associated with technical feasibility and costs. The disadvantages associated with this alternative far outweigh any advantages. Also, based on the social aspects of this study, the necessary intervention to ease the severe flooding and erosion at the Malumfashi communities is needed urgently by the people

(Section 4.5). Consequently, under this scenario a delayed alternative is therefore not a viable option.

Table 5.8: Analysis of Alternatives

Consideration	Delayed Project Alternative	Do-Nothing Alternative	Planned Project Alternative
Demand-based (community desirability/ acceptability)	Not Acceptable	Not Acceptable	Acceptable
Location-based (accessibility)	Accessible but not acceptable	Not Applicable	Acceptable
Process or Activity-based (technical feasibility)	Viable but delay is not acceptable	Not Acceptable	Acceptable
Material-based (availability)	Available but not acceptable	Not Applicable	Acceptable
Cost-based (economic viability/implementability)	Moderate cost but Not economic	Low cost but Not economic	High Cost
Finding	Not a viable option	Not a viable option	Viable option

The “Do-Nothing” or No-Project Alternative will worsen the present situation and worsen poverty at the same time. The disadvantages associated with this alternative far outweigh any advantages. In addition, most of the affected communities where agricultural activities dominate will still be cut off due to lack of effective road linkages. The “Do-Nothing” or No-Project Alternative is therefore not a viable option.

The Malumfashi Intervention Projects (Proposed Projects) Alternative

The Malumfashi intervention projects’ Alternative requires the rehabilitation of the existing primary stormwater drainage corridors, and improve (upgrading, rehabilitation and maintenance) the existing access roads and secondary drainage channels to an acceptable safety and environmental standard. The advantages associated with this alternative far outweigh the disadvantages. Although initial costs would be high; the accrued social, economic, political and cultural benefits far outweigh the no-project alternative. Additionally, based on the social aspects of this study, this intervention is 100% desired by the people (Section 4.5). The objective of the intervention project is to eliminate floods and soil erosion in the project areas while salvaging the agricultural lands of the affected areas and also boost agricultural production through the provision of access roads for easy transportation of products. Moreover, hitherto post-harvest losses will be reduced and thus creating more benefits to the farmers in particular and Katsina State in general.

This alternative involves a lot of construction work, along with the associated positive and negative impacts. The essence of a project of this nature is to ensure that activities are undertaken in a way that minimizes the negative impacts of the project while enhancing the positive impacts. To this end, there is a need to ensure any activity that can result in negative impacts on the environment (biophysical and socio-economic) are identified and mitigating measures planned for each negative impact.

CHAPTER 6: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

This Environmental and Social Management Plan (ESMP) is necessary to achieve the health, safety, and environmental regulatory compliance objectives of the project. The environmental and social management systems/procedures are developed to establish sound basis for mitigation, monitoring and management at the project level. The E&S requirements are integrated into existing procedures to ensure that project bottlenecks are not created. To this end, the Plan has focused on specific steps to be taken with respect to implementation of the mitigation measures and monitoring activities for the environmental and social impacts identified in Chapter 5.

The plan highlights the specific mitigation measures that would be taken and the entities responsible for carrying out the mitigating measures. The ESMP also contains a monitoring plan indicating the responsible parties, the frequency of monitoring, key indicators and the reporting format, and provides for necessary capacity building to facilitate the ESMP implementation. Cost estimates for implementation of the various measures, monitoring plan and capacity building are also given. The projected implementation budget will enable the ESMP to be an integral part of financing for the construction and maintenance works in the project.

6.1 Mitigation Measures for Implementation

Based on the environmental and social impact categories identified in Chapter 5 (see Section 5.4), the ESMP implementation for each of the Malumfashi projects will address measures that cover the following impacts during the construction and the post construction (operation and maintenance) phases of the project implementation:

Social Impacts:

- Loss of means of livelihood
- Loss of physical assets
- Displacement of persons (temporary)
- Loss of physical cultural resources
- Land use restriction

These impacts are addressed hereunder as Community and PAPs Issues Management.

Environmental Impacts:

- Air quality and dust
- Surface and ground water quality
- Noise and vibration
- Vegetation loss
- Public/Occupational Health and Safety
- Traffic and Transportation
- Earth movement
- Solid and liquid wastes
- Landscape change

These impacts are addressed hereunder as:

- 1) Dust control and air quality management;
- 2) Water resources, erosion control and flood prevention management;
- 3) Noise and vibration exposure management;
- 4) Flora and fauna removal management;
- 5) Public and occupational health and safety management;
- 6) Construction operation and slope stabilization;
- 7) Road diversion and accident prevention;
- 8) Waste management;
- 9) Temporary project office site management; and,

10) Post construction management.

The mitigation measures to address the above environmental and social impact categories as well as the monitoring and responsibility roles for the different phases of the project implementation are discussed under Section 6.2 below.

6.2 Environmental and Social Impact Mitigation Measures

The environmental and social impacts mitigation measures to address the identified impact categories for the Malumfashi intervention project areas are presented in Table .6-1. These mitigation measures will be implemented by the Contractor selected for the Malumfashi projects who shall be solely responsible through the course of the project and shall be contractually required to develop all the necessary site-specific management plans associated with the mitigation of each impact area. The monitoring aspects of the project implementation shall be carried out by other identified Agencies and organizations including the SPMU-ESO/SLO, SMeEnv., SMOw, SMLS, Community leaders, Site Committee, NGOs/CBOs, etc in accordance with the provisions and requirements of this ESMP.

Table 6.1: Summary of Impacts and Mitigation Measures for Malumfashi Projects

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
PRE CONSTRUCTION				
1	<p><u>Impacts on Community and PAP Management (Loss of physical assets; Loss of means of livelihood; Displacement of persons (temporary))</u></p> <ul style="list-style-type: none"> • Possible damage to building structures and other structural elements within the specific Malumfashi communities; • Permanent acquisition of land for setback to be used for site stabilization; • Temporary use of land for project staging areas, erection of workers' camp and temporary offices (Agreement between Communities and Contractor). • Croplands and economic trees within setback lands may be destroyed during site stabilization. • Construction activities may affect 	<ul style="list-style-type: none"> • Appropriate compensations shall be paid for structural damages; project acquired lands; temporary use of lands; destroyed crops and economic trees. • Compensation to persons (PAPs) within the specific Malumfashi communities who will need to be temporarily relocated prior to beginning of construction activities. • Create awareness among the specific Malumfashi community members and sensitize the people to all project activities • Seek the consent of Malumfashi Communities and landowners to erect the site office for the specified duration of the project; • Sign Agreement with Community and for the temporary acquisition of land; • Agree on other measures to render the site safe and usable to the satisfaction of the landowners at completion of project. • A stand-alone Resettlement Action Plan has been prepared for this project addressing impacts on Malumfashi communities 	<ul style="list-style-type: none"> • No. of public complaints recorded in the specific Malumfashi communities; • Level of awareness and understanding of Malumfashi Communitiesmembers; • No of Malumfashi Community members that attend trainings; • Level of satisfaction among Malumfashi PAPs; • No of women gainfully employed by project; • No of other businesses induced by project in the Communities; • Questionnaires, direct observations and interviews. 	<p>SPMU-SLO ; Focal NGO SMeEnv.; SMLS.; Malumfashi Communities Leaders; Site Committee</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	<p>persons with critical health conditions, including old persons, children and other vulnerable persons, such persons may be temporarily relocated for the construction phase.</p> <ul style="list-style-type: none"> • Possible disagreement over siting of staging areas and temporary facilities between community and contractor 	<p>and the PAP management. The SPMU shall be required to implement the RAP in accordance with the provisions therein.</p> <ul style="list-style-type: none"> • To be resolved in accordance with provisions in the Agreement by the Malumfashi Communities and landowners and the Contractor. 		
2	<p><u>Community Cultural Heritage</u></p> <ul style="list-style-type: none"> • There may be cultural relics in the vicinity of some project areas which could be impacted during construction activities. 	<ul style="list-style-type: none"> • Relocation of identified cultural relics; • Compensation for any damaged cultural relic or for relocation issues. • The Contractor shall be required to prepare and submit a Cultural Heritage Management Plan to the SPMU for approval and adoption for the contractor's implementation 	<ul style="list-style-type: none"> • Protection of all identified treasure finds 	<p>SPMU-SLO ; Focal NGO ; SMOEnv.; SMLS.; Malumfashi Communities Leaders; Project Site Committee</p>
3	<p><u>Public/Stakeholders Participation</u></p> <ul style="list-style-type: none"> • Non-involvement of project community and stakeholders affects the project post-construction maintenance and sustainability 	<ul style="list-style-type: none"> • Build capacities within Malumfashi communities • Incorporate community feedback into project implementation process • Disseminate project ESMP findings to Malumfashi Communities; • Ensure that period of inaccessibility to land is as short as possible • Awareness campaigns and capacity building. • The Contractor shall be required to prepare and submit a Stakeholders' Engagement Plan to the SPMU for approval and adoption for the contractor's implementation 	<ul style="list-style-type: none"> • No of active participants from Malumfashi communities and other stakeholders 	<p>SPMU-SLO, ESO; Focal NGO; SMOW; SMOEnv; SMOH; Malumfashi Communities' Leaders; Project Site Committee</p>
4	<p><u>Vegetation and Biomass Removal Management</u></p> <ul style="list-style-type: none"> • Damage to the natural and planted vegetation on any 	<ul style="list-style-type: none"> • Mark out areas for clearance & where possible use manual method of vegetation clearing; • Undertake selective clearance by removing tall 	<ul style="list-style-type: none"> • Areas of stressed vegetation; • Size of cleared vegetation areas 	<p>SPMU-ESO, NRO; Focal NGO; SMOW; SMOEnv; SMOH; Malumfashi Communities</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	<p>acquired setback lands during site clearance, areas for siting of temporary office and workers camp.</p> <ul style="list-style-type: none"> • Impact on flora and fauna. • Impact on wild life. 	<p>woody species leaving saplings for quick regeneration of vegetation;</p> <ul style="list-style-type: none"> • Prevent colonization by invasive species. • Prevent damage to critical ecosystems and habitats. • Prevent destruction of flora and fauna. • The Contractor shall be required to prepare and submit a Vegetation and Biomass Management Plan to the SPMU for approval and adoption for the contractor's implementation 		<p>Leaders; Project Site Committee</p>
CONSTRUCTION PHASE				
5	<p><u>Dust and Air Quality Management</u></p> <ul style="list-style-type: none"> • Air pollution is expected from dust and emissions from construction vehicles, plant and equipment. • Dust is generated by excavation and earth moving operations and causes nuisance to residents and other sensitive receptors. • Exhaust emissions occur from poor maintenance of plant and equipment or over revving of engines. 	<ul style="list-style-type: none"> • Dust generation will be controlled mainly by the use of water, especially in the dry season. • Use of water tanker for purposes of water dousing to control dust emission. • Erection of speed control signals and ramps mounted in communities; • Covering of hauling trucks carrying sand and other aggregates; • Covering of heaped material e.g. sand will be covered; • Use of nose masks by all workers at road maintenance/works sites. • Surfaces of vegetation along the maintenance road will be monitored to verify the effectiveness of dust suppression method. • The Contractor shall be required to prepare and submit an Air Quality Management Plan to the SPMU for approval and adoption for the contractor's implementation. 	<ul style="list-style-type: none"> • No. of public complaints; • Level of particulates in air • Level of other air pollutants • Vegetation surfaces free of dusts • Ambient air monitoring using standard methods 	<p>SPMU-ESO; Focal NGO SMOH.; Malumfashi Communities Leaders; Project Site Committee</p>
6	<p><u>Water Resources, Erosion and Sedimentation, Run-off Control Management</u></p>	<ul style="list-style-type: none"> • Location for heaping construction material (e.g. sand and other aggregates) not less than 50m from water bodies and drainage 	<ul style="list-style-type: none"> • No of complaints from Malumfashi Community members; • Absence of sediment build up around project 	<p>SPMU-ESO, PE; Focal NGO; SMOW; Malumfashi Communities</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	<ul style="list-style-type: none"> Increased sedimentation and runoff may result from activities during the construction works. Earthworks release suspended particles into watercourses, which can have temporary detrimental effects on water organisms. Spillages of fuel and other petroleum products cause contamination of the soil and water resources. Excavation at the borrow pits may cause land degradation in the vicinity of the borrow pits; may cause soil erosion and siltation of nearby roads. 	<p>channels (i.e. a separation distance of 50m will be observed);</p> <ul style="list-style-type: none"> Site for fueling of machinery and servicing of equipment will be located at a minimum distance of 100m from any water bodies, wetlands and drainage channels; Embankment erection around fueling and other liquid or spill-able storage sites in order to limit or contain such material from escape to potentially pollute water resources; Side drains (where appropriate) will be provided with settling basins near water bodies to remove silt and debris from road surface and construction site run-off, before discharge to adjoining streams or rivers; Adequate side drains provided to carry run-off into drainage channels to prevent erosion; Culverts of suitable capacity constructed to contain and direct flow, especially at peak flow and run-off; Road maintenance works to be carried out off peak rainy season; Provision of toilets and urinal at locations not less than 50m away from water bodies; and Adequate worker awareness on sanitation and measures to avoid water resource contamination. The Contractor shall be required to prepare and submit a Water management Plan and an Erosion and Sedimentation Management Plan to the SPMU for approval and adoption for the contractor's implementation. 	<p>areas;</p> <ul style="list-style-type: none"> Absence of flooding in construction areas; No of spills & repairs made; Use of standard monitoring methods 	<p>Leaders; Project Site Committee</p>
7	<u>Noise and Vibration Exposure Management</u>	<ul style="list-style-type: none"> Equipment servicing plan will be prepared and strictly followed to ensure efficient machinery performance and 	<ul style="list-style-type: none"> No of complaints from Malumfashi Community members; Absence of structural 	<p>SPMU-ESO; Local NGO; SMOW; SMOH;</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	<ul style="list-style-type: none"> Noise will emanate from moving vehicles, excavators, generators, power tools (e.g. for vegetation clearing), and compressors during construction. Vibrations may come from soil compaction equipment and other vibroequipment to be used 	<p>optimum noise generation.</p> <ul style="list-style-type: none"> Stationary equipment shall be sited at safe distances from sensitive areas to minimize noise impacts Workers operating noisy equipment will not be exposed continuously for more than 3 hours a day. Workers will be provided with ear plugs. Workers handling vibrating equipment or parts will be given pads to absorb the vibrations and will not be exposed continuously for longer than 3 hours a day. Sanctions (ranging from a warning to dismissal) will be instituted by the contractor against workers who do not observe the use of appropriate PPEs 	<p>failures;</p> <ul style="list-style-type: none"> Absence of debris accumulation; No of debris removals & repairs made; Sensor measurements around workplace 	<p>Malumfashi Communities Leaders; Project Site Committee</p>
8	<p><u>Occupational/Public Health and Safety Management</u></p> <ul style="list-style-type: none"> Occupational accident during construction. Construction operations pose hazards to people living or working near construction areas or employed to work on site. Excavations, construction traffic and stockpiled materials pose particular threats to children and livestock. Children may be inadvertently recruited to work on construction sites. 	<ul style="list-style-type: none"> Health, safety and environmental training and awareness will be extended to Malumfashi Community members and local residents; Erection of warning signals and use of reflective tapes at approaches to excavations, heaped materials, stationary equipment, etc. Posting of speed limits of 25km/hr at approaches to construction sites; Safety meetings held twice a week and documented accordingly; Inductions and awareness programmes held for all employees on occupational health and safety practices; A First Aid team formed to provide first aid services to workers and where appropriate make referrals to the nearest Health Centre or hospital; First Aid team to be trained by a medical team from the Health Centre; Accident records at construction site and neighbourhoods to be maintained both for workers and the public; 	<ul style="list-style-type: none"> No. of sanitary facilities provided at start of project; Adherence to stipulated speed limit Records and No of incidents; Use of PPEs by workers; Records of appropriate workers' training; Record of reinstatement plan for burrow pits; Record of health and safety meetings Record of first aid exercises Hazards assessment 	<p>SPMU-ESO; Focal NGO; SMOH; Malumfashi Community Leaders; Project Site Committee;</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
		<ul style="list-style-type: none"> • Stocks of PPEs to be maintained and supplied to workers regularly as needed; and • Workers required to wear the appropriate PPEs e.g. helmets, ear plugs, nose masks, vibration pads, hand gloves, etc. • The Contractor shall be required to prepare and submit a Community/Occupational Health Management Plan to the SPMU for approval and adoption for the contractor's implementation 		
9	<p><u>Gender Based Violence Management</u></p> <p><u>Labour Influx</u></p>	<ul style="list-style-type: none"> • Inductions and awareness programmes held for all employees on GBV/SEA issues; • GBV/SEA awareness will be extended to Malumfashi Communities members and local residents; • GBV/SEA records at construction site and neighbourhoods to be maintained both for workers and the public; • Workers required to report any GBV/SEA issues to the construction management. • The Contractor shall be required to prepare and submit a Gender Based Violence Management Plan to the SPMU for approval and adoption for the contractor's implementation • Establishment and operation of an effective GRM accessible to community members to facilitate early identification of problems and targeted mitigating interventions. • Provision of information regarding Worker Code of Conduct in local language and inclusion of a cultural sensitization training for workers regarding engagement with local community • Sourcing of local workforce against bringing more people, introduction of 	<ul style="list-style-type: none"> • No. of GBV/SEA awareness workshops held; • Level of GBV/SEA awareness of workers & others; • No. of reported GBV cases • No of Greivances recorded • No of sensitization workshops help for workers on cultural issues. • Tracking and recording the number of project workers recruited for the project within and from outside the project area. • No of Road safety trainings held for 	<p>Focal NGO; SPMU-ESO; SLO; SMEnv; SMOH; Malumfashi Communities Leaders; Project Site Committee</p> <p>Contractor</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
		<p>sanctions for workers involved in criminal behaviours and a provision of substance abuse prevention and management program.</p> <ul style="list-style-type: none"> • Preparation and implementation of a traffic management plan; construction of additional or separate access roads to project and workers' camp site, conduct road safety training for workers and inclusion of sanctions or fines for reckless driving by workers. 	workers.	
10	<p><u>HIV/AIDS and STIs Management</u></p> <ul style="list-style-type: none"> • Construction workers camp give rise to health risks associated with poor sexual practices and prostitution. 	<ul style="list-style-type: none"> • Provide quarterly HIV/AIDS and STIs awareness programmes for workers and nearby communities; • Health and HIV awareness team arranged from the State Health Ministry for the quarterly programmes; • Sponsored educational package put together by the team to be implemented to enlighten both workers and communities; • Training of peer educators within the work force and in communities by the team; and • The contractor to provide free condom supplies and encourage free discussions, counseling and testing. 	<ul style="list-style-type: none"> • No. of HIV/AIDS workshops held; • Level of awareness of workers & others; • Records of peer educators' training; • Records of condoms distributed 	<p>Focal NGO; SPMU-ESO; SMOEnv; SMOH; Malumfashi Communities Leaders; Project Site Committee</p>
11	<p><u>Construction Operation and Slope Stabilization</u></p> <ul style="list-style-type: none"> • Construction operations will result in topographic alterations. • Construction operations may result in landslides, rock cave-ins, and mudflow/flooding. • Construction operations can pose earth movement hazards to people working near the construction areas due to unstable soil 	<ul style="list-style-type: none"> • Maximize local employment (including women) on construction works (there should be a contractual requirement to hire a percentage of local workforce including women) • Provide occupational health and safety awareness training and workshops, • Use of child labor shall be strictly prohibited • Routinely Monitor and maintain construction work for continued stability and quality • Shortcomings in the control structures including the check dams (retention basins) should be corrected 	<ul style="list-style-type: none"> • No. of accidents/incidents; • No. of visible warning signs; • Level of public awareness; • Record of safety meetings held; 	<p>SPMU-ESO, PE; Focal NGO; SMOH; SMOEnv; Malumfashi Communities Leaders; Project Site Committee</p>

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	profiles from site excavations.	before they develop into serious problems. <ul style="list-style-type: none"> The Contractor shall be required to prepare and submit an Emergency Response and Incident Plan to the SPMU for approval and adoption for the contractor's implementation 		
12	<p><u>Traffic and Transportation Hazards</u></p> <ul style="list-style-type: none"> Traffic movements associated with site staff transportation, delivery of materials and the removal of waste during the construction is likely. Occasional movement of abnormal vehicular loads on local roads may result in temporary diversions. 	<ul style="list-style-type: none"> A temporary structure to be constructed on one lane to allow for traffic flow while work is on-going on the other lane; Traffic wardens to be posted at positions 100m from the construction points on either side of the road to ensure orderly traffic flow; Actual working areas to be secured with barricades; Adequate road warning signs to be posted at vantage points to warn and direct traffic; Traffic and transport associated with project will adhere to existing roads or follow specified routes as established. All measures shall be effectively monitored by Contractor to ensure their implementation. The Contractor shall be required to prepare and submit a Traffic and Vehicle Management Plan to the SPMU for approval and adoption for the contractor's implementation 	<ul style="list-style-type: none"> Effective traffic flow with vehicular & worker safety; Appropriate positioning of road signs, reflectors, speed ramps, control limits, traffic wardens; Records of accidents and near misses No of public complaints. 	SPMU-ESO, PE; Focal NGO; SMOW; SMeNV; Malumfashi Communities Leaders; Project Site Committee
13	<p><u>Waste Management (solid and liquid wastes)</u></p> <ul style="list-style-type: none"> Proposed project will generate waste during construction including off specification materials such as cement, wood, plastic, paper and domestic waste from construction areas and worker camps. 	<ul style="list-style-type: none"> Waste bins to be provided for the disposal of waste generated; Waste will be segregated into three at source - organic (food residues), recyclables (woods, metals) and non-recyclables (plastic and glass wastes); Organic waste to be composted near the site office to enrich the soil, while plastics and glass are taken to the district dump-sites; 	<ul style="list-style-type: none"> Waste segregation and littering; Emptying of bins at waste dump sites; Waste composting; Indiscriminate defecation; Toilets decommissioning 	SPMU-ESO; Focal NGO; SMOW; SMeNV; Malumfashi Communities Leaders; Project Site Committee

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	This could result in increased pressure on local waste dump facilities as well as potential for unauthorized disposal and littering if not properly managed.	<ul style="list-style-type: none"> • Topsoil removed from the right of way for maintenance work to be spread on the land to avoid disrupting drainage network; and • Toilets and urinals to be sited at least 100m from any stream or drainage channel and decommissioned at the end of project. • The Contractor shall be required to prepare and submit a Waste Management Plan to the SPMU for approval and adoption for the contractor's implementation 		
OPERATIONS & MAINTENANCE PHASE (POST CONSTRUCTION)				
14	<p><u>Land use restriction</u></p> <ul style="list-style-type: none"> • Use of acquired land associated with the project setbacks will be altered and restricted to community recreational uses. Structures may never be erected on this portion of land but economic trees could be planted. 	<ul style="list-style-type: none"> • Create awareness among community members; • Build capacities within community; • Incorporate community feedback mechanism into process • Ensure periodic monitoring of restricted areas • Continuous maintenance of erosion control structures including concrete channels and check dams, and bio-remediated areas for continued effectiveness. 	<ul style="list-style-type: none"> • Sustained treated flood and erosion healing process 	SPMU-ESO; SMEnv; Focal NGO; Malumfashi Communities Leaders; Project Site Committee
15	<p><u>Closure of temporary office, staging areas and decommissioning of project</u></p> <ul style="list-style-type: none"> • Damage to land forms and vegetation 	<ul style="list-style-type: none"> • Ensure that agreements with the community and landowners on post construction hand-over are kept. • Enforce agreed measures to render the site safe and usable post construction to the satisfaction of the community and landowners. 	<ul style="list-style-type: none"> • Agreements entered with community and landowners for use of land; • Terms of Agreement fulfilled with community and landowners; • Handover of office site as agreed 	SPMU-ESO, NRO; Focal NGO; Malumfashi Communities Leaders; Project Site Committee
16	<p><u>Erosion control system failure management</u></p> <ul style="list-style-type: none"> • Check dams that are not properly 	<ul style="list-style-type: none"> • Any treated erosion areas should be checked regularly and the healing process monitored closely. • Structures built in the channelization for 	<ul style="list-style-type: none"> • Sustained flood healing process 	SPMU – PE Malumfashi Communities Leaders; Project Site Committee CBOs/CDOs

Item No	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
	Environmental and Social Impact Source	Mitigation Measures	Monitoring	Responsibility
	constructed may suffer damage that could reduce the structural integrity of the erosion control structures during post-construction phase.	stabilization purpose should be observed for damage especially during rainy seasons and after heavy storms. Any damage observed should be repaired immediately to avoid further damage and the eventual collapse.		

6.3 Institutional Responsibilities and Accountabilities

The structure and reporting arrangements for the implementation of the ESMP are integrated into the overall project monitoring and evaluation program for the Malumfashi stormwater drainage rehabilitation project. The key actors as well as the roles and responsibilities of the various institutions in the ESMP implementation are as shown in Table 6.2. The matrix includes listing of all entities (public and private) responsible for designing and implementing the various aspects of the plan. The need for additional capacity building for the involved institutions and actors, including long-term consultation and training program for the implementing agency are also built into the structure.

Table 6.2: Institutional Responsibilities

Institutional Category	Project Implementation Phase	Roles & Responsibilities
Katsina State Ministry of Environment (SMEnv)	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Lead role to ensure adherence to the ESMP and applicable standards, environmental and social liability investigations, Monitoring and evaluation process and criteria • Executing agency with overall responsibility for NEWMAP implementation in the State. • Ensure that sufficient funds are made available to the SPMU; • Ensure that SPMU, regardless of financing source, complies with the provisions of the ESMP and WB safeguard policy. • Ensure that SPMU complies with KTSG environmental policies and regulations. • Ensure that the SPMU retain dedicated Technical Support for the project duration including safeguard specialists to oversee ESMP implementation. • Ensure that SPMU monitor environmental protection and mitigation measures in the ESMP and those activities that are embodied in the detailed designs; • Ensure that SPMU has secured environmental clearances certification from FMENV and WB prior to award and/or commencement of civil works contracts; • Ensure that SPMU establishes and implements an environmental grievance redress mechanism, as described in the ESMP, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance • Ensure that the bidding and contract documents include the ESMP; • Ensure that SPMU submits semi-annual monitoring reports on the ESMP implementation to WB and FPMU.
SPMU (Safeguard Officers, PRO, Project Engineer, M&E)	Pre-Construction Phase	<ul style="list-style-type: none"> • Ensure that bidding and contract documents include the ESMP; • Review and approve all required management plans necessary for the pre-construction, construction and post construction phases of the project; • Undertake monitoring of the implementation of the ESMP (mitigation and monitoring measures) with support from the appointed Focal NGO, the Site Committee, the Contractor and other stakeholders. • Report to WB and FPMU on all aspects of social and environmental

Institutional Category	Project Implementation Phase	Roles & Responsibilities
		<p>management and monitoring at required frequency;</p> <ul style="list-style-type: none"> • Submit monthly and quarterly or semi-annual monitoring reports on ESMP implementation to FPMU and WB; • Participate in grievance redress mechanism, as described in the this document, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the sub-project's environmental performance • Based on the results of the ESMP monitoring, identify environmental corrective actions and prepare a corrective action plan • Maintain and manage all funds effectively and efficiently for the project; • Coordinate all policies, programmes and actions associated with the intervention construction works; • Ensure the smooth and efficient implementation of the preconstruction phase of project's various programmes; • Have custody of a copy of the ESMP and disseminate information contained therein accordingly.
	Construction Phase	<ul style="list-style-type: none"> • Cooperate with the Steering/Technical Committees to provide guidance to the technical aspects of all project activities; • Provide oversight of contractors work plan and E&S implementation schedule; • Conduct weekly or routine site inspection and monitor implementation of E&S safeguards; • Receive and review reports from the contractor; • Prepare and submit weekly/monthly and subsequent quarterly and annual reports to the SPMU Project Coordinator, FPMU and the WB.
	Post Construction Phase	<ul style="list-style-type: none"> • Ensure proper closures of all contractor's temporary facilities; • Ensure that the terms of Agreement between the Contractor and the community and land owners are fulfilled.
FPMU	All Phases (Pre-construction, Construction and Post Construction)	<ul style="list-style-type: none"> • Project assessment and monitoring of the ESMP implementation and the construction activities. •
World Bank	All Phases (Pre-Construction, Construction and Post Construction)	<ul style="list-style-type: none"> • Assessment of specific and general project implementation; • Recommend additional measures for strengthening the management framework and implementation performance.
State Ministry of Works	Pre-Construction and Construction Phases	<ul style="list-style-type: none"> • Provide necessary preconstruction and construction support to the SPMU • Site assessment and monitoring of construction works and engineering activities;
State Ministry of Lands & Survey (SMLS)	Pre-Construction Phase	<ul style="list-style-type: none"> • Compliance overseer at State Level, on matters of land acquisition, compensation and other resettlement issues
FMEv, NESREA, Other MDAs	Pre-Construction and Construction Phases	<ul style="list-style-type: none"> • Intervene in areas under their jurisdiction as and when project demands
Contractor (Site Manager, Site Engineers/ Supervisors)	Pre-Construction Phase	<ul style="list-style-type: none"> • Recruit qualified environmental safeguard specialist to ensure compliance with environmental statutory and contractual obligations and proper implementation of the ESMP • Implement all the provisions of the ESMP in coordination with the SPMU and other relevant authorities • Develop and submit for SPMU and FPMU approvals specific management plans as provided in the ESMP. • Provide sufficient funding and human resources for proper and timely implementation of required mitigation measures in the ESMP • Implement additional environmental mitigation measures for unexpected impacts, as necessary • Develop a work plan which incorporates schedule for E&S safeguards implementation; • Submit the work plan and schedule of E&S safeguard implementation to the SPMU; • Train/create awareness of all personnel/workers on relevant E&S safeguard measures and their obligations; • Ensure land disturbance activities are conducted in accordance with relevant legislation and the ESMP; • Communicate content of ESMP to all employees and contractor agents;

Institutional Category	Project Implementation Phase	Roles & Responsibilities
		<ul style="list-style-type: none"> • Provide oversight function during mobilization to ensure adherence to good practice and the ESMP
	Construction Phase	<ul style="list-style-type: none"> • Implement all E&S safeguards and other mitigation measures as planned; • Submit monthly and quarterly implementation reports on E&S safeguards to SPMU; • Comply with BEME specification in procurement of material and construction, and adherence to the ESMP and good construction practices; • Ensure land disturbance activities are conducted in accordance with relevant legislation and the ESMP; • Provide adequate onsite waste collection bins, ensure proper disposal, not to litter and not to create environmental nuisance; • Provide oversight function during construction to ensure adherence to good practice and the ESMP
	Post Construction Phase	<ul style="list-style-type: none"> • Provide oversight function during decommissioning to ensure adherence to good practice and the ESMP
Site Committee	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Monitor and ensure compliance to ESMP provisions as well as contractor implementation quality
Local government	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Provide support in monitoring project execution within their domains to ensure compliance with the ESMP and other relevant requirements
Local Community	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Promote environmental awareness; • Assist and liaise with other stakeholders to ensure proper siting and provision of approval for such sites; • Support with provision of necessary infrastructures and engage/encourage carrying out comprehensive and practical awareness campaign for the proposed projects, amongst the various relevant grass roots interest groups.
CDOs	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Ensure community participation by mobilizing, sensitizing community members;
Focal NGO	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Assist to ensure effective response actions, to evolve and devise sustainable environmental strategies and rehabilitation techniques, organize, coordinate and ensure safe use of volunteers in a response action, & provide wide support in management planning, institutional/governance issues and other livelihood related matter, awareness campaigns
General Public	All Phases (Preconstruction, Construction and Post Construction)	<ul style="list-style-type: none"> • Identify issues that could derail the project; • Support project impacts mitigation measures as well as awareness campaigns.

6.4 Capacity of Katsina NEWMAP to Implement the ESMPs

6.4.1 Capacity and Training Needs

In order to achieve effective ESMP implementation, there is need to strengthen relevant competencies on environmental and social management at primarily the State level and secondarily, the LGA and community levels including contractors. This will stimulate the required collaboration among the key actors. Experience has shown that strengthening capacity involves more than improving technical skills, developing new systems or establishing quality assurance and improvement standards. While these are important, strengthening capacity is however, essentially about changing behavior towards achieving desired goals.

The capacity building should include equipping individuals with the understanding, skills and access to information and training that enables them to perform effectively. Personnel of the erosion control intervention project need to understand the purpose of the ESMP and their expected roles during its implementation. The target groups for the training will include:

- SPMU E&S Safeguard Officers and Project Engineers;
- Contractor's personnel;
- Construction workers and site personnel; and,
- Select members from the project communities.

The SPMU E&S safeguard officers and contractors will require capacity building in the implementation of the projects' environmental and social safeguards and general project planning and management interfaced with E&S components. Capacity requirements are also necessary in the areas of E&S monitoring and reporting, adherence to the required E&S principles, standards and commitments. The construction workers and select members of the project communities will undergo training on public awareness creation/educational techniques (on environmental, social and health issues) and first aid procedures.

6.4.2 Capacity Building Cost

The capacity building plan for the ESMP with the associated cost implications is shown in Table 6.3 below. To enhance the respective roles and collaboration of the relevant stakeholders, the broad areas for capacity building and effective ESMP implementation are identified and shown in Table 6.3.

Table 6.3: Summary of Institutional Capacity and Training Needs with Costs

Programme Description	Participants	Form of Training	Duration	Training Agency	Estimated Cost In (₦) and Project Phase
<u>Understanding the Environment:</u> <ul style="list-style-type: none"> • Concepts, Regulations & Statutory Requirements; • Environmental Management; • Flood and Erosion Prevention & Control; • Stakeholder & Community Participation 	Officials of SMEnv, SEPA, SMOW, SMLS, SPMU, Contractor, Community Leaders, Focal NGO, CBOs & Other Relevant Groups	Workshop	1 Day	External Agency for capacity building or Environmental & Social Specialist	1,500,000.00 (Pre-Construction Phase)
<u>Scope of Malumfashi Drainage Intervention Projects:</u> <ul style="list-style-type: none"> • Environmental & Social Impacts; • Engineering Design and Associated ESMP; • Coordination with Other MDAs and the Community 	Contractor, SPMU Safeguard Officers and Project Engineers, SMENV, SEPA & relevant MDAs, Community Leaders, CDOs, & NGOs	Workshop	1 Day	External Agency for capacity building or Environmental & Social Specialist	1,500,000.00 (Pre-Construction Phase)
<u>Project Implementation:</u> <ul style="list-style-type: none"> • Civil Works with Bio-remediation in the project; • Roles and Responsibilities of Key Actors; • Environmental Monitoring 	SPMU Project Engineers and Safeguard Officers, Contractors, SMEnv, SEPA	Lecture and Site Visit	1 Day	External Agency for capacity building or Environmental & Social Specialist	2,000,000.00 (Construction Phase)
<u>Monitoring and Evaluation and GRM:</u> <ul style="list-style-type: none"> • ESMP Monitoring and Reporting Strategy; • Stakeholder and Community Participation 	Contractor, SPMU Safeguard Officers, Engineers, SMEnv, SEPA & relevant MDAs, Community Leaders, CDOs, & Focal NGO	Workshop	1 Day	Environmental & Social Specialists; External Agency engaged for capacity building	1,000,000.00 (Construction Phase)

Programme Description	Participants	Form of Training	Duration	Training Agency	Estimated Cost In (₦) and Project Phase
<u>Watershed Protection and Management:</u> <ul style="list-style-type: none"> Alternative income generation programme for stakeholders and skills requirements; Promotion of Agricultural Methods and Technologies for Improving Farm Production and Erosion Prevention; 	Watershed Committee, Community Leaders, LGA Staff, Support Professionals	Workshop	1 Day	World Bank/External Agency Engaged for Capacity Building/ Environmental & Social Specialists	1,000,000.00 (Post-Construction Phase)
TOTALS					₦7,000,000.00

The capacity building and trainings costs shown in Table 6-3 shall be included as part of the overall project construction cost to be funded by the Contractor as part of preparedness for ESMP implementation. The trainings are to be conducted preparatory to the contractor's mobilization to site. All trainings shall therefore be completed prior to mobilization or latest two weeks after the contractor has mobilized to site.

6.5 E&S Obligations of the Construction Contractors

It is the responsibility of the construction contractors to ensure compliance with all the Engineering Design provisions associated with this project. The SPMU shall not be responsible for any property (whether community, corporate or individual) damaged as a result of actions or activities undertaken or being undertaken by the contractor in the course of executing its contract. In the event of such damage, the contractor shall be fully liable for the cost of such damage.

As part of the construction approval process for the project, a set of environmental and social management plans is needed to address the specific issues identified in this ESMP which may arise in the course of the project. The management plans will need to be developed by the Contractor to address the specific impacts as identified in this ESMP. These management plans are briefly described in the following sections and shall be implemented as part of the overall environmental and social management and monitoring plans for the Malumfashi Stormwater Drainage Project.

6.6 Required Environmental and Social Management Plans

The construction Contractors for the projects shall be required to meet the specific E&S safeguard obligations as provided in this ESMP which shall be incorporated into the contract specifications for the projects as provided in Annex IV. The contractors shall also be required to develop work programmes for field work to guide and explain how the mitigation measures recommended in this ESMP will be implemented during the Malumfashi projects execution. This is in addition to other contractual provisions for the projects. The required specific E&S management plans include the following:

6.6.1 Resettlement Action Plans

The WB requires the preparation, in advance of project implementation, of a Resettlement Action Plan/Abbreviated Resettlement Action Plan (RAP/ARAP) where project impacts are known to displace persons within the project community or affect their social and economic well-being. The RAP/ARAP seeks to specifically identify, evaluate and document the set of mitigation, monitoring and institutional actions to be undertaken for the project to eliminate identified adverse community or individual social and livelihood impacts before commencing the remedial construction and rehabilitation works.

The Resettlement Action Plans for the Malumfashi project are being prepared as stand-alone documents and are incorporated accordingly into this Environmental and Social Management Plan by reference.

6.6.2 Public/Stakeholder Consultation Plan

A key element of sustaining stakeholders' support in the project is to sustain the consultations and communication process that has already been effectively established in the course of the preparation of this ESMP. Stakeholders' engagement needs to be enhanced and managed through a well-defined strategy. Table 6.4 provides a summary of the stakeholder consultation activities to be considered in the engagement plan. Public sensitization and consultation will continue throughout the project execution.

The Contractors shall be required to prepare and submit for approval of SPMU and FPMU, comprehensive Stakeholder Engagement Plans. The Plans will provide the Contractor's specific engagement plan to ensure that all segments of the community and other stakeholders are fully and effectively involved in the project decision process.

Table 6.4: Summary of Stakeholder Consultation Plan

Activity	Stakeholders / Community	Timeline
Pre-Construction / Prior to Project Commencement		
Project briefings, site tours, personal meetings, community sessions, consultation meetings	State Government , Local Government, Site committee, Residents of affected areas/ Community and interest groups	As required, subject to project updates and feedback from the community
Development/dissemination of feedback and complaints mechanism and communications procedures	State Government , Local Government, Site committee, Residents of affected areas/ Community and interest groups	As required, subject to any updates on the project
Briefings, Site Tours and Community Sessions for flood control and intervention works	Government authorities, Local communities, Key/ relevant stakeholders	Prior to Work Plan approval
Construction and Operations		
Responding to issues and inquiries as per feedback and complaints mechanism	All stakeholders	Ongoing / as required
Monthly/Quarterly reporting on status of project	All stakeholders	Monthly/quarterly/as required.
Briefings, site tours and community sessions for flood control and intervention works closure plan	Government authorities, Local communities, Key/ relevant stakeholders	Prior to project completion
Prior to Project Closeout/Post-Construction		
Project briefings, site tours, personal meetings, community sessions, consultation meetings with stakeholders	All stakeholders, State Govt , Local Govt, Site committee, Affected residents/ Community/ interest groups	As required, subject to approvals and feedback from the community

6.6.3 Chance Finds/Cultural Heritage Management Plan (CHMP)

The Chance Finds/Cultural Heritage Management Plan (CHMP) is required to address the specific impacts that may occur as a result of any "Archaeological Chance Finds" or existence of cultural heritage resources during the planned construction works. It is anticipated that some of the construction activities associated with the project may impact cultural resources such as the grave yards.

The grave yards identified within the project areas are considered only of local significance and may not be affected by construction. However, if any grave yard needs to be relocated on account of the project, the local people, community leaders, NGOs and others should reach a consensus and the local people should be involved in the process of relocation. Alternatively, if the graveyard is considered of archaeological and historical value, then the Contractor shall develop a strategy for restoration, conservation and management which shall be implemented.

In the event of any "Archaeological Chance Finds", the construction contractor should comply with the following rules as well as the Federal or State archaeological laws:

- notify relevant departments of such findings,
- request a site inspection,
- completely halt work until inspection results are received, and
- decide whether or not to proceed with further work.

The Contractor shall prepare and submit for approval of SPMU and FPMU, the necessary CHMP to be implemented for the project. The CHMP will set out a formal system by which the Contractor will carry out mitigation measures that will reduce any impacts to the Cultural Heritage. Specifically, the CHMP will provide details regarding the implementation of avoidance, mitigation and management measures for impacts related to the possibility of archaeological chance finds or any existing cultural heritage of significance. The scope of the CHMP will cover pre-construction, construction and post construction/closure phases of the Project.

6.6.4 Occupational/Public Health, Safety and Security Management Plan

Selected Contractors shall be required to develop and implement an occupational and community health and safety plans that contributes to a healthy workforce and local community for each of the Malumfashi projects. The health and safety plan shall be submitted to the SPMU and FPMU for necessary approvals prior to implementation. In developing the Plans, the Contractors shall evaluate possible hazards that may be associated with the projects activities such as: (a) imported backfill material; (b) Hazards to the aquatic environment arising from toxic effects of imported material (pH, COD, salinity, dispersed material); (c) Flood hazards due to heavy downpour during the construction period; (d) Physical/mechanical hazards due to the movement of solid material in the event of an accident; (e) Hazards resulting from soil contamination.

Selected Contractors shall also be required to identify who and what can be affected assuming possible scenarios (such as construction failures). Consideration should be given to issues relating to the environment (water, soil, and biota), humans (life, health and living conditions), and economic losses of the population (damage to infrastructure, property) in the event of the possible scenarios. Cooperation between the Contractor, the SPMU and the local community is recommended for emergency planning.

Selected Contractors shall fully comply with ESHS standards and bear the cost of implementation. Community Health, Safety and Security assessment will identify potential negative risks related to the different phases of the project. Some of the significant risks to be considered include:

- Possible pressure and/or additional demand on community health services associated with the influx of workers from outside the project area;
- Possible pressure and/or additional demand on utility services including water and wastewater system associated with the influx of workers from outside the project area;
- Possible pressure and/or additional demand for social services as a result of an increased family stress and violence;
- Possible sexual harassment and gender based violence;
- Possible illicit drug use and alcohol;
- Possible crime and criminal activities;
- Possible change in community wellness as a result of alcohol, and substance abuse associated with the influx of workers from outside the project area;
- Possible change in Community Health as a result of sudden spread of communicable and non-communicable diseases including sexually transmitted diseases (STDs) associated with the influx of workers from outside the project area;

- Possible pressure on traffic and transportation network associated with construction and operations activities; and
- Possible change in water and air quality associated with construction and operations activities.
- In addition to the potential negative impacts which would require mitigation, the rehabilitation of the drainage corridor also has the potential to improve community health safety and security through the following means:
 - Improved access to medical facilities for communities due to the drainage rehabilitation and the restoration of connecting roadways;
 - Improved healthcare infrastructure;
 - Improved workforce health awareness;
 - Improved standards of living of direct and indirect employees due to better income in the employees households; and
 - Improved standards of living of vulnerable groups and their households, including support to the elderly within the respective households.

6.6.5 Gender Based Violence/Sexual Exploitation and Abuse Management Plan

The Gender Based Violence/Sexual Exploitation and Abuse Management Plan (GBV/SEA MP) is required to identify and assess key risks, develop mitigation measures to prevent and respond to sexual exploitation, abuse and other forms of Gender Based Violence (GBV). Selected Contractors shall prepare and submit for approval of SPMU and FPMU, the necessary GBV/SEA MP to be implemented for the projects. The GBV/SEA MP will set out a formal system by which the Contractors will carry out mitigation measures that will reduce any impacts relating to Gender Based Violence matters.

Specifically, the GBV/SEA MP will provide details regarding the implementation of avoidance mitigation and management measures for impacts related to the possibility of or any existing risks which may lead to GBV/SEA issues. The scope of the GBV/SEA MP will cover pre-construction, construction and post construction/closure phases of the Projects.

The risk indicators to be considered shall include but not limited to:

- Possible pressure and/or additional demand for social services as a result of an increased family stress and violence;
- Possible sexual harassment (including rape, sexual assault and harassment in all public and private spheres of life);
- Norms, attitudes and stereotypes around gender in general and violence against women in particular;
- Various forms of structural inequality or institutional discrimination on any particular gender.

6.6.6 Vegetation Clearing and Biomass Management Plan

The Contractors shall be required to prepare and submit for approval of SPMU and FPMU, a comprehensive Vegetation Clearing and Biomass Management Plan (VCBMP). Together with this ESMP, the VCBMP will provide the specific activities to be carried out to protect the natural biodiversity of the project area as well as maintain appropriate public access.

The specific objectives of the Plan are to:

- Identify appropriate, ecologically sustainable, and spatially-explicit management actions, such as re-vegetation with native plant species, based on biological and hydrological factors, as well as the reasonableness of costs, local community expectations, and other key considerations.
- Develop monitoring methods to evaluate progress toward Plan objectives, to apply adaptive management to enhance the likelihood of achieving those objectives, and to increase understanding of water and ecosystem interactions.
- Prepare for anticipated changes to the system, such as climate change and land-use changes.

- Prepare for implementation of rapid, active ecological restoration and other management strategies for threatened, endangered, and other native wildlife species potentially displaced by construction activities, and to enhance pollinator habitat.
- Provide consideration of proper implementation techniques, implementation costs, short- and long-term maintenance needs, water use/savings, and wildfire control.

The approved Plan shall form part of the construction documents and requirements for Contractors implementation through the project.

6.6.7 Air Quality Management Plan

Air quality plans identify potential control measures and strategies, including rules and regulations that could be implemented to reduce air pollutant emissions from construction equipment, on and off road motor vehicles, and other sources. The Contractors shall be required to prepare and submit for approval of SPMU and FPMU, a comprehensive Air Quality Management Plan (AQMP). The Contractors shall implement these strategies through rules and regulations, public education and outreach, and partnerships with other agencies and stakeholders.

6.6.8 Emergency Response and Incident Plan

The Contractors shall be required to prepare and submit for approval of SPMU and FPMU, a comprehensive Emergency Response and Incident Plan (ERIP). The Plan will describe the set of necessary actions to be taken in response to defined circumstances, across all hazards, and through the phases of mitigation, preparedness, response, and recovery during this project.

The Plan will provide necessary guidance for how to organize assets to respond to an incident (system description) and processes to manage the response through its successive stages (concept of operations). The Plan will document the combination of facilities, equipment, personnel, procedures, and communications existing within the Contractor's organizational structure and designed to help in the management of resources during incident response.

The activities contained in the Plan will address the phases of mitigation, preparedness, response, and recovery and will identify potential hazards, assess their likelihood of occurrence, their potential impact and the organization's vulnerabilities to the impact, and also provide a basis for understanding how the hazard likelihood and organizational vulnerabilities can be addressed.

For the Plan to be effective, the emergency incident must be formally defined so that there is clarity and consistency as to what is being managed. This may be best accomplished by defining the incident response through delineation of response goals and objectives, and by explaining response parameters through the Emergency Response and Incident Plan (ERIP).

6.6.9 Water Management Plan

The Contractors shall be required to prepare and submit for approval of SPMU and FPMU, a Water Management Plan. The Plan will provide information about current water uses and charts a course for water efficiency improvements, conservation activities, and water-reduction goals.

An important step in creating a water management plan is to establish a water balance for the project. It is necessary to ensure that water supply, wastewater, storm water issues, and water efficiency Best Management Practices (BMPs) are taken into account prior to commencement of the construction works. Water emergency and other contingency plans should describe how the construction facility will meet minimum water needs during emergency or other water shortages.

6.6.10 Erosion and Sedimentation Management Plan

Selected Contractors shall prepare and submit for approval of SPMU and FPMU, a comprehensive Erosion and Sedimentation Management Plan. Together with this ESMP, the Plan will provide the specific activities to be carried out to protect the environment from erosion and sedimentation within the project area. It is important that an erosion and sediment control plan is effective in preventing illicit discharge. Appropriate consideration should be given to identify potential problems posed by the project area slopes, drainage patterns, and soil types in preparing an effective erosion and sediment control plan.

The erosion and sediment control plan shall be overlaid on the project grading plan(s) or site plan if there is no grading plan.

- The plan shall show what Best Management Practices (BMPs) will be used, when, and where, specific to the project scope, along with the total disturbance area and installation details and notes for the proposed BMPs. Measures will include those necessary to delineate areas of work, prevent erosion of unstable or denuded areas, plan for construction staging and storage logistics, construction of stabilized access points, and proper containment measures for construction materials and waste.
- The name and contact information for the person responsible for maintaining erosion and sediment control measures throughout the construction work shall be included as Erosion Control Point of Contact.
- Location, width, direction of flow and approximate location of top and toes of banks of any watercourses.
- Location and types of existing vegetation on the site. Within 10 meter of any cut or fill, the plan shall identify the location, diameter, species and appropriate elevation at the base of all trees over 0.3 m in diameter measured at 1.5m above average ground level.
- Existing drainage patterns and direction of flow.
- Limits of disturbed areas.
- Areas not to be disturbed and off-limits to construction activity.
- Location of proposed vegetative erosion control measures (e.g., seeding, landscaping), including type, quantity, planting schedule, and irrigation.
- Location and details of all proposed drainage systems, walls, cribbing or other erosion protection devices to be constructed in connection with, or as a part of, the project.

6.6.11 Traffic and Vehicle Management Plan

Managing traffic at a construction workplace is an important part of ensuring the workplace is without risks to health and safety. Vehicles including powered mobile plant moving in and around a workplace, reversing, loading and unloading are often linked with death and injuries to workers and members of the public. Traffic includes cars, trucks and powered mobile plant like excavators or graders, and pedestrians like workers and visitors. The most effective way to protect pedestrians is to eliminate traffic hazards.

Selected Contractors shall be required to prepare and submit for approval of SPMU and FPMU, a comprehensive Traffic and Vehicle Management Plan (TVMP). Together with this ESMP, the TVMP will provide the specific and general guide to vehicular movements throughout the project area in order to protect the community and workforce from accident and safety hazards during construction.

Key issues to consider for managing traffic at the construction workplace include:

- Keeping pedestrians and vehicles apart including on site and when vehicles enter and exit the workplace;
- Minimizing vehicle movements;
- Eliminating reversing vehicles or minimizing the related risks;
- Ensuring vehicles and pedestrians are visible to each other;

- Using traffic signs, and,
- Developing and implementing a traffic management plan.

Selected Contractors shall be required to provide appropriate information, training, instruction or supervision necessary to protect all persons from risks to their health and safety. The Contractors must also ensure construction induction training is provided to workers who carry out construction work.

- The Katsina State NEWMAP will place speed limits and appropriate road signage along all Project roads;
- The Katsina State NEWMAP will enforce speed limits for safety, air quality, and noise purposes both on the Project site and beyond;
- All Katsina State NEWMAP drivers should be trained by a road safety specialist; and,
- All vehicles should be properly maintained and undergo periodic safety inspections.
- Observance of speed limits by contractor's vehicles / drivers should be part of the contractual agreements

6.6.12 Waste Management Plan

A waste management plan (WMP) is required to achieve the goals set for managing construction waste. The construction Contractors shall prepare and submit for approval of SPMU and FPMU, a comprehensive Waste Management Plan (WMP). The WMP will provide the specific and general guide to the management of solid and liquid wastes throughout the project area and for the duration of the project. The Contractors shall have responsibility for the implementation of the Plan which will include procedures for salvage, reuse and recycling of materials. The implementation of the WMP will protect the community and workforce from the health hazards of indiscriminate waste disposal during construction.

The waste management plan should cover the following:

- i. Specify who is responsible for managing waste on site.
- ii. Establish goals and objectives.
- iii. Estimate the waste types and amounts involved.
- iv. Set targets for reducing the amount of each waste sent to the waste disposal site;
- v. Describe recycling/reuse methods for each material.
- vi. Identify the waste destinations and transport modes, including what materials are being segregated on site for reuse or recycling.
- vii. Track progress.
- viii. Describe special measures for material use and handling.
- ix. Describe communication and training to support and encourage participation from everyone on site.

6.6.13 Chemical Management Plan

Selected Contractors shall prepare and submit for approval of SPMU and FPMU, Chemical Management Plan (CMP) for each of the Malumfashi project. The CMP will provide specific and general guidance in the storage, use and disposal of any chemicals or chemical products associated with activities to be carried out as part of the project. Chemicals are an integral part of everyday life, essential to our economy, our communities and our homes. While chemical substances provide benefits, they may also have harmful effects on human health and the environment if not properly managed.

The CMP is aimed at protecting human health and the environment by assessing chemicals used in the project and by taking action on the chemicals found to be harmful. The CMP

helps protect the project community and their environment from the harmful effects of chemical substances. The CMP will assess the environmental and human health risks posed by the chemical substances to be used in the project, and also develop measures to be implemented to prevent or manage those risks.

6.7 ESMP Monitoring and Evaluation

The objectives of the monitoring and evaluation program are:

- To ensure that the measures suggested herein are carried out accordingly during project implementation;
- To evaluate the efficiency of the proposed mitigation and enhancement measures;
- To investigate the adequacy of the ESMP as well as suggest improvements to it;
- To generate data that could be incorporated in future ESMPs;
- To evaluate what additional enforcement is required for the effective project implementation.

For effective implementation of the ESMP, a monitoring programme has been designed. The monitoring plan indicates the operational links between the impacts identified, indicators to be measured, the methods to be used, frequency of measurements and definition of thresholds indicating the need for corrective actions. The necessary costs and the responsibilities for all aspects of the monitoring arrangements are also identified.

6.7.1 Monitoring and Reporting

Project performance monitoring has the overall objective of achieving the desired outcomes through reporting of measurable events or parameters or aspects that can be monitored and verified. The following monitoring and reporting sequence is proposed for the ESMP implementation at each of the Malumfashi projects.

- The respective Contractors shall submit to SPMU a monthly monitoring report and the ESMP accomplishments during the project implementations,
- The SPMU shall prepare monthly ESMP monitoring and accomplishment reports to be submitted to FPMU and the WB.

This reporting cycle should be repeated as the feedback mechanism scheme to all key players consisting of the affected stakeholders, Site Committee, Focal NGO, CBOs/CDOs, Contractors, SPMU, etc.

6.7.2 Post Construction Monitoring

In the post-construction phase of the project, the respective Site Committee shall be required to maintain continuous monitoring of the Malumfashi project beyond the decommissioning phase. This will ensure that each Malumfashi project rehabilitation/healing process and the associated livelihood programmes are sustained beyond the project closeout. Since the Site Committee will have a big role in sustaining the post construction (operations and maintenance) phase of the project, necessary capacity building trainings will be required to provide its officers/leaders the needed capabilities for formulating necessary policies, systems and procedures. The SPMU and the SMEnv will be required to ensure that the Site Committees and other CBOs/CDOs are institutionally strengthened.

A summary of the impacts mitigation and monitoring plan for the preconstruction, construction, and post-construction phases with the associated monitoring frequencies, responsible parties and projected costs are presented in Table 6-.

6.8 Grievance Mechanism and Procedures

It is for the benefit of the MOE/KTSG, NEWMAP, Communities and the PAPs to devise a mechanism through which complaints and disagreements arising from the implementation of the Malumfashi drainage project can be resolved. A Grievance Redress Mechanism (GRM) is necessary in order to prevent and address community issues, reduce exposure to risks and also provide the platform for the optimization of environmental and social benefits of the

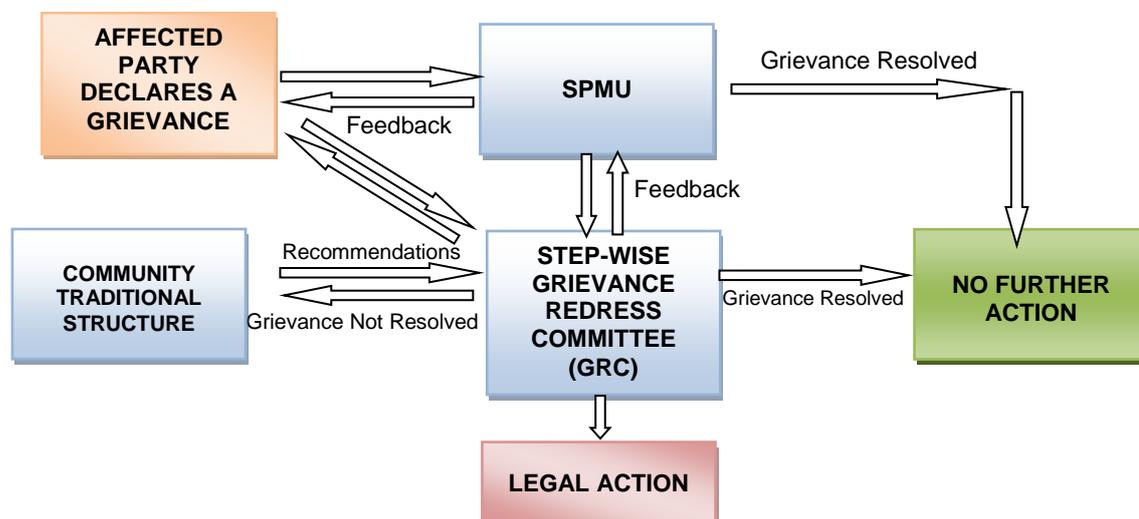
project. The grievance procedures consist of the steps that ensure proper documentation of all grievances, a discussion mechanism for hearing and resolving the grievances, and provisions for appeals in the event of dissatisfaction by any affected persons.

The issues considered include: the project's benefit(s) to the stakeholders; potential changes to the routine activities of the stakeholders that might occur due to the project; and the project activities that might cause damage or conflict for the stakeholders. Any issues that may lead to grievances will be addressed through documented grievance mechanism that takes into consideration the cultural and traditional rights of people avoiding as much as possible potential for legal redress mechanism. The specific objective of the mechanism is to facilitate the process and ensure effective and timely grievance resolution thereby reducing the risk of escalation of conflicts and avoiding unnecessary delays. The grievances and remedial actions shall be carefully documented to enhance accountability and reduce liability.

The community traditional land dispute resolution structure currently constitutes the nucleus of traditional resolution of disputes among community members on matters of land. It is therefore wise and advisable that this structure be necessarily retained in the event of any grievance or dispute relating to the ESMP implementation. Inputs from the leadership may also be limited to providing recommendations as to how a specific dispute is to be addressed. Aside from the traditional structure, Figure 6-1 provides a secondary mechanism for grievance resolution using the Grievance Redress Committee (GRC). The proposed GRM will also help to achieve the following:

- To serve as the open channel for effective communication together with the identification of emerging environmental and social concerns due to the project;
- To prevent and mitigate any adverse environmental and social impacts as a result of any phase of the project;
- Promote harmonious relationship and respect among stakeholders; and,
- Ensure community acceptance of the project.

Figure 6-1: Grievance Redress Procedure



6.8.1 Formation of Grievance Redress Committee (GRC)

The objective of the GRC is to respond to the complaints relating to the project in a timely and transparent manner and to provide a mechanism to mediate conflict and cut down on lengthy litigation, which often delays projects. It will also provide people who might have objections or concerns about their assistance a public forum to raise their objections and through conflict resolution, address these issues adequately. The committee will provide

ample opportunity to redress complaints informally, in addition to the existing formal administrative and legal procedures.

The major grievances that might require mitigation include:

- PAPs not listed;
- Use of local workforce;
- GBV/SEA Issues
- Losses not identified correctly;
- Inadequate assistance;
- Dispute about ownership;
- Delay in disbursement of assistance and improper distribution of assistance.

The NEWMAP SPMU shall establish necessary levels of Grievance Redress Committees (GRC) overseen by NEWMAP for each of the Malumfashi projects to address complaints from this ESMP implementation. Each GRC shall provide specific necessary support and resolution of the potential PAP related grievances in accordance with provisions of this ESMP. The Committees will be coordinated as provided for at each level with the compositions of each GRC level comprising of the following:

FIRST LEVEL: COMMUNITY GRIEVANCE REDRESS COMMITTEE (COM-GRC)

The first stage of the GRC in the grievance process shall be the community-based GRC (Community GRC) which shall be coordinated by the Focal NGO (FNGO) and shall be made up of the following:

- 1 Representative from each of the Community Associations
- 1 Representative from the traditional ruler of the Community
- 1 Representative of the Local Government Area
- 1 Representative of Ministry of Lands, Survey and Physical Planning.
- 1 Representative of the Project Affected Persons (PAPs)
- Social and Livelihood Officer (SLO) in SPMU as the Secretary
- 1 Representative from the Focal NGO as coordinator

This committee shall be the place of first recourse for anyone who has a grievance matter related to the site. The timeline for addressing/resolving the issues raised by a complainant by this GRC shall be at most 15 days from the last day allowable for grievance and complaints submission following the end of ESMP disclosure.

SECOND LEVEL: PMU GRIEVANCE REDRESS COMMITTEE (PMU-GRC)

Where the Com-GRC is unable to resolve the matter, the Complainant may seek redress from the Project Management Unit – Grievance Redress Committee (PMU-GRC). This Committee shall be coordinated by the Project Coordinator of the SPMU and made up of the following:

- 1 Representative from the Ministry of Environment
- 1 Representative from the Ministry of Lands and Survey
- 1 Representatives of the Project Affected Persons (PAPs)
- 1 Representative from the Focal NGO
- Environmental Officer in SPMU as the Secretary
- Project Accountant in the SPMU
- Project Coordinator of the SPMU as the Coordinator

This committee shall be the second place of recourse for anyone who has a grievance matter related to the site. The timeline for addressing/resolution of the issues raised by a complainant by this PMU-GRC shall be at most 15 days from the last day allowable for grievance and complaints submission following the inability of the Com-GRC to resolve the matter.

THIRD LEVEL: NEWMAP STEERING/TECHNICAL COMMITTEE (STATE-GRC)

Where the PMU-GRC is unable to resolve the matter at this level, the Complainant may seek

redress from the NEWMAP Steering and Technical Committee GRC (STATE-GRC). This Committee will be coordinated by the Chairman of the Steering Committee, who is the Honourable Commissioner of the Ministry of Environment. The composition of this Committee shall be as follows:

- The Federal Environmental Safeguards Specialist
- Representative of the Umbrella NGO
- Environmental Officers from 2 neighboring NEWMAP states who have experience in handling grievance matters
- Project Coordinator of the SPMU as the Secretary

The timeline for addressing/resolving issues raised by a complainant by this STATE-GRC shall be at most 15 days from the last day allowable for grievance and complaints submission following the inability of the PMU- GRC to resolve the matter.

FOURTH LEVEL: THE COURTS

Where the Complainant is not satisfied with the decisions of the STATE-GRC, he/she may seek redress in the law Courts.

All grievances will first of all be addressed at the First Level. It will only move on to Second Level if the first level agreement was not accepted by the party involved and then to third and forth under similar situations. If negotiated settlement of grievances cannot be achieved through the normal procedural steps outlined in the grievance mechanism, the complainant has the right to approach the courts. The GRM procedure will be included in the community engagement plan to ensure that all PAPs know and understand the process and are able to access it whenever they feel the need. The effectiveness of the GRM will be one of the crucial monitoring indicators.

6.8.2 Training of the Grievance Redress Committee

The various Grievance Redress Committee shall be provided with training to enable them adequately perform their responsibilities. The training shall be organized by the SPMU who shall provide logistics such as writing materials, per diem, transportation, training venue and time.

The details of the training including time and date shall be adequately communicated to all members for their attendance. At the end of the training, members of the intervention community shall be adequately sensitized on the procedure for submission of complaints and grievances.

Table 6-5A E&S Impact Mitigation and Monitoring Plan for Malumfashi Stormwater Drainage Project

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
PRE-CONSTRUCTION PHASE									
Safeguard Instrument (ESMP)		Ensure that identified E&S impacts are addressed and mitigation measures are executed properly	Environmental and social management measures as spelled out in this document (details are as enumerated below)	SMEEnv & SPMU	To be included in the overall project construction cost	Approval of ESMP Report by FMEEnv & WB; Commencement of construction activities; Availability of completed & approved plans	Monitoring parameters as indicated in this ESMP	FPMU & WB	N/A
Impacts on Community and PAP Management (Loss of physical assets; Loss of means of livelihood; Displacement of persons (temporary))	All those impact sources that are indicated in Table 6.1, Item 1, Column 1	To restore persons affected by the project to a condition equivalent to or better than the pre-project situation	A Resettlement Action Plan (RAP) has been prepared as a stand-alone document; All those impact mitigation measures that are indicated in Table 6.1, Item 1, Column 2	SMEEnv & SPMU	To be included in the total RAP cost	<ul style="list-style-type: none"> No. of public complaints recorded; Level of awareness and understanding of community members; No of community members that attend trainings; Level of satisfaction among PAPs; No of women gainfully employed by project; No of other businesses induced by project Questionnaires, direct observations and interviews. 	Continuous Quarterly Continuous Quarterly Quarterly; Six months intervals Every two years	SPMU-ESO; Focal NGO SMEEnv.; SMLS.; Community Leaders; Site Committee	Included in total cost provided in the RAP 350,000.00
Community Cultural Heritage	All those impact sources that are indicated in Table 6.1, Item 2, Column 1	Ensure that community's historical, archeological, and cultural treasures are not destroyed during project execution	All those impact mitigation measures that are indicated in Table 6.1, Item 2; Column 2	SMEEnv & SPMU Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> Protection of all identified treasure finds 	Continuously	Focal NGO; SPMU; SMEEnv; Community Leaders; Site Committee	250,000.00

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
			Develop and submit for SPMU approval a Cultural Heritage Management Plan; Possibility of chance archeological findings						
Public/Stakeholders Participation	All those impact sources that are indicated in Table 6.1, Item 3, Column 1	Ensure effective community and stakeholder involvement in the project decision process	Develop and submit for SPMU approval a Stakeholders Engagement Plan; All those impact mitigation measures that are indicated in Table 6.1, Item 3, Column 2	Contractor Contractor	To be included in the overall project construction cost	• No of active participants from the community and other stakeholders	Continuously	Focal NGO; SPMU; SMEnv; Community Leaders; Site Committee	300,000.00
Vegetation and Biomass Removal Management	All those impact sources that are indicated in Table 6.1, Item 4, Column 1	Prevent damage to critical ecosystems and habitats and destruction of flora and fauna	Develop and submit for SPMU approval a Vegetation and Biomass Removal Management Plan;	Contractor Contractor	To be included in the overall project construction cost	Areas of stressed vegetation; Size of cleared vegetation areas	Monthly Monthly	SPMU-ESO; Focal NGO; SMOW; SMEnv; SMOH; Community Leaders; Site Committee	450,000.00

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
			All those impact mitigation measures that are indicated in Table 6.1, Item 4, Column 2						
CONSTRUCTION PHASE									
Dust and Air Quality Management	All those impact sources that are indicated in Table 6.1, Item 5, Column 1	To minimize emission of hydrocarbons and generation of dust at the work site and access roads	Develop and submit for SPMU approval an Air Quality Management Plan; All those impact mitigation measures that are indicated in Table 6.1, Item 5, Column 2	Contractor Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> No. of public complaints; Level of particulates Level of air pollutants Vegetation surfaces free of dusts Ambient air monitoring using standard methods 	Twice daily Continuous as necessary Continuous as necessary Two month intervals or as required	SPMU-ESO; Focal NGO SMOH.; Community Leaders; Site Committee	550,000.00
Water Resources, Erosion & Sedimentation Control Management	All those impact sources that are indicated in Table 6.1, Item 6, Column 1	Ensure that project area is adequately protected from development of erosion and sedimentation hazards	Develop and submit for SPMU approval a Water Management Plan and an Erosion and Sedimentation Management Plan;	Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> No of complaints from community members; Absence of sediment build up; Absence of flooding in construction areas; No of spills & repairs made; Use of standard monitoring methods 	Daily Daily Daily Daily	SPMU-ESO; Focal NGO; SMOW; Community Leaders; Site Committee;	450,000.00

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
			All those impact mitigation measures that are indicated in Table 6.1, Item 6, Column 2	Contractor				Three month intervals	
Noise and Vibration Exposure Management	All those impact sources that are indicated in Table 6.1, Item 7, Column 1	Ensure adequate protection of the workforce and community members from effects of noise and vibrations	<ul style="list-style-type: none"> All those impact mitigation measures that are indicated in Table 6.1, Item 7, Column 2 	Contractor – Site Engineer	To be included in the overall project construction cost	<ul style="list-style-type: none"> No of complaints from community members; Absence of structural failures; Absence of debris accumulation; No of debris removals & repairs made; Sensor measurements around workplace 	Daily Daily Daily Daily	SPMU-ESO; Local NGO; SMOW; SMOH; Community Leaders; Site Committee	500,000.00
Occupational & Public Health and Safety Management	All those impact sources that are indicated in Table 6.1, Item 8, Column 1	Ensure that identified occupational & public health, safety and security impacts are addressed and mitigation measures are executed properly	Develop and submit for SPMU approval an Occupational and Public Health, Safety and Security Management Plan; All those impact mitigation measures that are indicated in Table 6.1, Item 8, Column 2	Contractor Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> No. of sanitary facilities provided at start of project; Adherence to stipulated speed limit Record of incidents; Use of PPEs by workers; Records of appropriate workers' training; Record of reinstatement plan for burrow pits; Record of health and safety meetings Record of first aid exercises Hazards assessment 	At start of project; Twice weekly; Weekly; Daily; Monthly; At beginning of project Weekly; Monthly At start of project	SPMU-ESO; Focal NGO; SMOH; Community Leaders; Site Committee;	600,000.00

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
HIV/AIDS and STIs Management	All those impact sources that are indicated in Table 6.1, Item 9, Column 1	Ensure effective HIV/AIDS and STI awareness among community members	<ul style="list-style-type: none"> All those impact mitigation measures that are indicated in Table 6.1, Item 9, Column 2 	SPMU Safeguard Officers; MOH; NGO; Contractor-Health & Safety Personnel	To be included in the overall project construction cost	<ul style="list-style-type: none"> No. of HIV/AIDS workshops held; Level of awareness of workers & others; Records of peer educators' training; Records of condoms distributed 	Quarterly Continuous Bi-monthly Monthly	Focal NGO; SPMU-ESO; SMOH; Community Leaders; Site Committee;	500,000.00
Construction Operations & Slope Stabilization	All those impact sources that are indicated in Table 6.1, Item 10, Column 1	To ensure that construction activities are carried out without risks to health and safety of the workforce and the community	<ul style="list-style-type: none"> Develop and submit for SPMU approval an Emergency Response and Incident Plan; All those impact mitigation measures that are indicated in Table 6.1, Item 10, Column 2 	Contractor Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> No of workshops for Gender Based Violence and Child Labour held; No. of accidents/incidents; No. of visible warning signs; Level of public awareness; Record of safety meetings held; 	Daily; Daily; Continuous; Weekly.	SPMU-ESO; Focal NGO; SMOW; SMOH; Community Leaders; Site Committee	350,000.00
Traffic and Transportation Hazards	All those impact sources that are indicated in Table 6.1, Item 11, Column 1	To ensure that traffic within the project area is managed so as to assure the workplace and community are without risks to health and safety	<ul style="list-style-type: none"> Develop and submit for SPMU approval a Traffic and Vehicle Management Plan; All those impact mitigation measures that are indicated in 	Contractor Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> Effective traffic flow with vehicular & worker safety; Appropriate positioning of road signs, reflectors, speed ramps, control limits, traffic wardens; Records of accidents and near misses 	Daily; Daily; Daily.	SPMU-ESO; Focal NGO; SMOW; SMOH; Community Leaders; Site Committee	350,000.00

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
			Table 6.1, Item 11, Column 2						
Waste Management (Solid and Liquid Wastes)	All those impact sources that are indicated in Table 6.1, Item 12, Column 1	To protect the community and the workforce from health hazards of indiscriminate waste disposal by proper collection and disposal of liquid and solid wastes generated on-site during the project.	Develop and submit for SPMU approval a Waste Management Plan; All those impact mitigation measures that are indicated in Table 6.1, Item 12, Column 2,	Contractor Contractor	To be included in the overall project construction cost	<ul style="list-style-type: none"> •Waste segregation and littering; •Emptying of bins at waste dump sites; •Waste composting; •Indiscriminate defecation; •Toilets decommissioning 	Daily; Weekly; Weekly; Daily; At end of project	SPMU-ESO; Focal NGO; SMOW; SMEnv; Community Leaders; Site Committee	400,000.00
						•			
OPERATION AND MAINTENANCE (POST CONSTRUCTION) PHASE									
Land Use Restriction	All those impact sources that are indicated in Table 6.1, Item 13, Column 1	To ensure that required project areas under restricted use remains as designated	All those impact mitigation measures that are indicated in Table 6.1, Item 13, Column 2	SPMU; SMEnv; Community Leaders; Site Committee		Sustained treated flood and erosion healing process	Routine monitoring of project corridor (6mos – 12mos)	SPMU-ESO; SMEnv; Focal NGO; Community Leaders; Site Committee	500,000.00
Closure of Temporary Office, Staging Areas and Decommissioning of	All those impact sources that are indicated	Ensure that agreements with the	<ul style="list-style-type: none"> •All those impact mitigation measures that 	Contractor	To be included in the overall project	Agreements entered with community and landowners for use of land;	Prior to start of project; Quarterly;	SPMU-ESO; Focal NGO; Community Leaders;	450,000.00

E&S Impact Category	Source of Impact	Objective	Impact Mitigation			Performance & Impact Monitoring			
			Proposed Mitigation Measures	Responsible to Implement	Mitigation Cost (N)	Monitoring Indicator	Monitoring Frequency	Responsible to Monitor	Monitoring Cost (N)
Project	in Table 6.1, Item 14, Column 1	community and landowners on post construction hand-over are kept.	are indicated in Table 6.1, Item 14, Column 2	Contractor	construction cost	Terms of Agreement fulfilled with community and landowners; Handover of office site as agreed	At completion of project	Site Committee	
System Control Failures Management	All those impact sources that are indicated in Table 6.1, Item 15, Column 1	Ensure sustainable maintenance of erosion prevention and control structures	All those impact mitigation measures that are indicated in Table 6.1, Item 15, Column 2	SPMU; Community Leaders; Site Committee		Sustained treated flood and erosion healing process	Routine monitoring of project corridor (6mos – 12mos)	Community Leaders; Site Committee CBOs/CDOs	350,000.00

Some of the occupational health issues/Hazards and mitigation measures

S/N	occupational health and safety issues	Mitigation Measures	Responsible party
1	The exclusion of occupational health and safety issues in contract documents	Occupational health issues shall be noted and included in contract documents to make them obligatory/mandatory.	SPMU FPMU Contractor
2	Use of defective, damaged or inappropriate tools for a particular and specific task.	Provide workers the appropriate and quality hand tools as are necessary for the execution of specific activities or tasks.	SPMU Contractor
3	Engagement of workers to use machines and tools for which they have not been trained.	Provide on-the-job training to workers on how to handle and use available tools and machinery before engaging them.	SPMU Contractor
4	Involvement of workers in activities without the provision of the appropriate	Appropriate protective wear to workers for specific activities/tasks. (Gumboots, gloves, overalls, helmets, etc.)	SPMU Contractor

	protective wear.		
5	Non provision of First Aid Kits (FAKs),	FAKs and trained personnel in administering first-aid must always be available on the site for purposes of minor injuries.	SPMU Contractor
6	The exposure of workers to dust during implementation of works.	Workers must wear the right protective gear. Watering of dusty areas must be done with a water at least three times a day to reduce dust levels to the barest minimum.	SPMU Contractor
7	Lack of informatory signposts indicating that work is in progress.	During execution of work especially at a site open to traffic, informatory signposts must be posted so as to lessen the risks of accidents to workers.	SPMU Contractor
8	Accidents involving plants/equipment	Only properly trained men for operation.	Contractor
9	Safety of and from traffic	Providing adequate traffic signs and protection at locations where works are taking place. Where necessary, traffic should be stopped during the placement or removal of temporary signs.	SPMU Contractor

A summary of the projected ESMP monitoring costs through the preconstruction, construction and post-construction phases of the project are presented in Table 6.6.

Table 6.6: Summary of Monitoring Cost by Project Site and Activity Area

Project Site	Catchment Area (km ²)	Drainage Length (km)	Associated Monitoring Costs (₦)		
			Pre-Construction	Construction	Post Construction
Malumfashi Stormwater Drainage Rehabilitation	29.399	7.85	400,000.00	3,000,000.00	1,300,000.00
TOTAL			400,000.00	3,000,000.00	1,300,000.00

6.9 ESMP Management Costs

A summary of the projected ESMP management costs through the preconstruction, construction and post-construction phases of the project are presented in Table 6.7.

Table 6.7: ESMP Management Costs

Institutional Category	Roles & Responsibilities	Associated Management Costs (₦)		
		Pre-Construction	Construction	Post Construction
Katsina State Ministry of Environment (SMEnv)	• Overall oversight, assessment and monitoring of specific and general project implementation ;	500,000.00	1,000,000.00	2,500,000.00
SPMU (Safeguard Officers, Project Engineer)	• Oversight of all specific activities associated with the ESMP implementation	1,500,000.00	3,200,000.00	1,200,000.00
FPMU	• Project assessment and monitoring of this ESMP implementation and the construction activities.	N/A	N/A	N/A
World Bank	• Overall assessment and monitoring of specific and general project implementation;	N/A	N/A	N/A
State Ministry of Works	• Provide necessary preconstruction and construction support to the SPMU	N/A	N/A	N/A
State Ministry of Lands & Survey (SMLS)	• Provide necessary support to the SPMU on matters of land acquisition, compensation and other resettlement issues	N/A	N/A	N/A
Other MDAs	• Intervene in areas under their jurisdiction as and when project demands	N/A	N/A	N/A
Contractor (Site Engineers/ Supervisors)	• Provide oversight function during decommissioning to ensure adherence to good practice and the ESMP	N/A	N/A	N/A
Site Committee	• Monitor and ensure compliance with ESMP, BEME and implementation quality	500,000.00	2,000,000.00	1,000,000.00
Local government	• Provide support in monitoring project execution within their domains to ensure compliance with this ESMP and other relevant requirements	N/A	N/A	N/A
Local Community	• Support and promote environmental awareness	N/A	N/A	N/A
CDOs/CBOs	• Ensure community participation by mobilizing, sensitizing community members;	N/A	N/A	300,000.00
NGOs	• Assist to ensure effective response actions, to evolve and devise sustainable environmental strategies and rehabilitation techniques, organize, coordinate and ensure safe use of	N/A	N/A	N/A

Institutional Category	Roles & Responsibilities	Associated Management Costs (₦)		
		Pre-Construction	Construction	Post Construction
	volunteers in a response action, & provide wide support in management planning, institutional/governance issues and other livelihood related matter, awareness campaigns			
General Public	<ul style="list-style-type: none"> Identify issues that could derail the project Support project impacts and mitigation measures as well as awareness campaigns 	N/A	N/A	N/A
TOTALS		₦2,500,000.00	₦6,200,000.00	₦5,000,000.00

6.10 Budget to Implement ESMP

Cost projections for implementation of the various measures, monitoring plan and capacity building are given in Table 6.8. The projected implementation budget will enable the ESMP to be an integral part of financing for the rehabilitation/maintenance works in the project.

An indicative budget of **₦28,140,000.00** (Twenty Eight Million One Hundred and Forty Thousand Naira) only, is shown for the implementation of the ESMP for the intervention site bearing in mind the elements that make up the implementation process. The budget covers:

1. Routine E & S duties of the SPMU;
2. Capacity Building for the SPMU and other stakeholders;
3. Engagement of Environmental and Social Specialists
4. Environmental and Social Due Diligence investigations and/or Audits;
5. Monitoring and evaluation activities of the SPMU and other regulatory Agencies.

Table 6.8: Breakdown of Cost Estimates

S/No	ITEM	RESPONSIBILITY	COST BREAKDOWN IN (N)			COST ESTIMATE IN NAIRA (N)	COST ESTIMATE IN (US\$)
			Pre-Construction Phase	Construction Phase	Post-Construction Phase		
1	MITIGATION	SPMU/ Contractor	(To be built into Contractor costs)				
2	MANAGEMENT	SPMU/ SEnv	2,500,000.00	6,200,000.00	5,000,000.00	N13,700,000.00	\$38,055.56
3	MONITORING	SPMU/ FPMU/ FEnv/ SEnv/ Environmental Consultants/ NGOs	500,000.00	4,500,000.00	1,600,000.00	N6,100,000.00	\$16,944.44
4	CAPACITY BUILDING & TRAININGS	SPMU/ MOH/ Consultants/ Contractor	3,000,000.00	3,000,000.00	1,000,000.00	N7,000,000.00	\$19,444.44
Sub-total						N26,800,000.00	\$74,444.44
5	CONTINGENCY (5%)					N1,340,000.00	\$3,722.22
GRAND TOTAL						N28,140,000.00	\$78,166.67

Assumed exchange rate: US\$1.00 = N360.00 (Nigerian Naira)

6.11 ESMP Implementation Schedule

The implementation and management of the ESMP schedule is designed to facilitate any necessary resettlement issues associated with the RAP. The ESMP activities also need to be implemented within an agreed timeframe and budget. Appropriate timing should be adhered to in order to avoid project delays especially if the situation arises where site clearing is to begin before the resettlement end date.

Execution of the ESMP activities is recommended in accordance with the schedule shown in Table 6.9. The period of the first week will be used to develop and set up all structures necessary to support all aspects of the programmes.

Table 6.9: Proposed ESMP Implementation Schedule

DESCRIPTION OF ACTIVITY	DURATION IN MONTHS																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Disclosure of ESMP Report	↔																							
Formation of Project Grievance Redress Committee (GRC)	↔																							
Review and Approval of Contractor's ESMP and Health, & Safety Plan		↔																						
Hold Stakeholders Meetings and Consultations	↔																							
Execute Capacity Building Programmes		↔																						
Implementation of Mitigation Measures			↔																					
Supervision of ESMP Implementation	↔																							
Monitoring & Reporting on ESMP Implementation	↔																							
Conduct ESMP Implementation Audit																							↔	
Programme Administration	↔																							

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The proposed redevelopment/rehabilitation of Malumfashi stormwater drainages project are considered to be in line with the development and socio-economic needs of Katsina State as a whole. The project will greatly ease the perennial devastating floods and soil erosion within the project communities and facilitate redevelopment of the agriculturally degraded lands and once again allow unimpeded use of agricultural lands. Indeed, the project have many positive socio-economic impacts both locally and regionally.

In view of positive and negative impacts identified, as well as public consultations conducted in the project areas, it is unlikely that the proposed projects will have overall significant adverse social and environmental impacts. Most adverse impacts will be temporary in nature during the construction phase and can be managed to acceptable levels. Implementation of the recommended mitigation measures for the project will ensure that the overall benefits of the project will greatly outweigh the few adverse impacts.

The main social issues for the project will revolve around the temporary displacement and relocation of people within the project areas and the permanent acquisition of setback lands for the rehabilitation of the major drainage corridors as well as the access roadways. Katsina State will compensate the PAPs with respect to the adverse impacts associated with temporary displacement and disturbance, loss of economic trees and crops and loss of lands.

There is a pressing need to rehabilitate the Malumfashi stormwater drainage corridor and install effective flood control/management system to reduce the incidence of flooding and erosion during periods of heavy rainfall. The quality of life of residents in Malumfashi communities is significantly and negatively impacted by the frequent incidence of flooding and erosion phenomenon, long-term pools of standing water which encourages the spread of waterborne disease and incidence of malaria.

The public consultations indicate a widespread support for the Malumfashi project as the people desperately look forward to a relief from the emotional trauma arising from devastating impacts of the floods as well as the need to improve their quality of life. The most commonly expressed comment in meetings was that the key to success of the system would be the need to implement an effective maintenance programme to ensure that (a) the Malumfashi drainage system system are effectively functional, and (b) the structural integrity of the Malumfashi systems as well as the proper functioning of the drains/culverts is maintained.

It is concluded that the Malumfashi Project are, in essence, a group of mitigation measures that are gravely needed to improve the conditions of communities endangered and blighted by the hazards of floods and erosion, and living helplessly in the face of perennial threats to lives and severe losses of properties, ancestral and agricultural lands.

7.2 Recommendations

The current lack of a formal solid waste management system is very apparent as waste and litter are indiscriminately abandoned throughout Malumfashi project communities. People use a variety of containers for waste disposal (e.g. plastic

bags, tins and baskets). However, these are make-shift solutions to a serious waste problem. No collection system means waste is left to rot throughout the project areas. The abandoned food waste attracts scavengers such as rats and cats. Once containers are opened by scavengers, waste is scattered widely by wind and animals. The ultimate litter and waste trap tends to be streams and water bodies which net result is a spiral of contamination of water and on-going environmental degradation that promotes the spread of disease.

There is widespread public support for implementing an effective waste collection and disposal system. Many schemes have been instigated in the past but have failed due to a lack of resources including infrastructure. The most commonly made comment, during the public consultation process, was that a community awareness programme will be key to the success of the waste collection and disposal system. It is therefore imperative that waste collection and disposal system that works on a regular basis is required so that the current problem of waste accumulation in water courses can be eliminated. It is therefore strongly recommended that the volumes of wastes that currently collect in streams should not be allowed to continue as they inhibit the effective flow through water courses thereby reducing the overall capacity of the drainage systems.

CHAPTER 8: DECOMMISSIONING/ABANDONEMENT

This section provides additional specific guidance on prevention and control of community health and safety impacts that may occur during project development and at the end of the project life-cycle. Many of the provisions here are adopted from the General EHS Guidelines of the World Bank.

Noise and Vibration

During decommissioning activities, noise and vibration may be caused by the earth moving and excavation equipment, the transportation of equipment, materials and people. It is recommended that noise reduction and control strategies be considered in areas close to community areas. These strategies include:

- Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance;
- Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines; and,
- Avoiding or minimizing project transportation through community areas.

Soil Erosion

Soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The mobilization and transport of soil particles may, in turn, result in sedimentation of surface drainage networks, which may result in impacts to the quality of natural water systems and ultimately the biological systems that use these waters. Recommended soil erosion and water system management approaches include reducing or preventing erosion by:

- Scheduling to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical
- Contouring and minimizing length and steepness of slopes
- Mulching to stabilize exposed areas
- Re-vegetating areas promptly
- Designing channels and ditches for post-construction flows;
- Lining steep channel and slopes (e.g. use jute matting).

Air Quality

Decommissioning activities may generate emission of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site. Techniques to consider for the reduction and control of air emissions from construction and decommissioning sites include:

- Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone);
- Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content;
- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements;

- Selectively removing potential hazardous air pollutants, such as asbestos, from existing infrastructure prior to demolition;
- Managing emissions from mobile sources;
- Avoiding open burning of solids.

Solid Waste

Non-hazardous solid waste generated at construction and decommissioning sites includes excess fill materials from grading and excavation activities, scrap wood and metals, and small concrete spills. Other non-hazardous solid wastes include office, kitchen, and dormitory wastes when these types of operations are part of construction project activities. Hazardous solid waste includes contaminated soils, which could potentially be encountered on-site due to previous land use activities, or small amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill cleanup materials from oil and fuel spills. Techniques for preventing and controlling nonhazardous and hazardous construction site solid waste include those already discussed in Section 1.6 of the EHS guidelines.

Hazardous Materials

Decommissioning activities may pose the potential for release of petroleum based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. These materials may also be encountered during decommissioning activities in building components or industrial process equipment. Techniques for prevention, minimization, and control of these impacts include:

- Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids;
- Using impervious surfaces for refueling areas and other fluid transfer areas;
- Training workers on the correct transfer and handling of fuels and chemicals and the response to spills;
- Providing portable spill containment and cleanup equipment on site and training in the equipment deployment;
- Assessing the contents of hazardous materials and petroleum-based products in building systems (e.g. PCB containing electrical equipment, asbestos-containing building materials) and process equipment and removing them prior to initiation of decommissioning activities.

Wastewater Discharges

Decommissioning activities may include the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved. Adequate portable or permanent sanitation facilities serving all workers should be provided at all construction sites. Sanitary wastewater in construction and other sites should be managed as prescribed in Section 1.3 of the EHS guidelines.

Contaminated Land

Land contamination may be encountered in sites under construction or decommissioning due to known or unknown historical releases of hazardous materials or oil, or due to the presence of abandoned infrastructure formerly used to store or handle these materials, including underground storage tanks. Actions necessary to manage the risk from contaminated land will depend on factors such as the level and location of contamination, the type and risks of the contaminated media, and the intended land use. However, a basic management strategy should

include:

- Managing contaminated media with the objective of protecting the safety and health of occupants of the site, the surrounding community, and the environment post construction or post decommissioning;
- Understanding the historical use of the land with regard to the potential presence of hazardous materials or oil prior to initiation of construction or decommissioning activities;
- Preparing plans and procedures to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment consistent with the approach for Contaminated Land in Section 1.6
- Preparation of a management plan to manage obsolete, abandoned, hazardous materials or oil consistent with the approach to hazardous waste management described in Section 1.6 of the EHS guidelines.

Slips and Falls

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites. Recommended methods for the prevention of slips and falls from, or on, the same elevation include:

- Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths;
- Cleaning up excessive waste debris and liquid spills regularly;
- Locating electrical cords and ropes in common areas and marked corridors;
- Use of slip retardant footwear.

Struck By Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities. Techniques for the prevention and control of these hazards include:

- Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels;
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable;
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap;
- Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged;
- Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures;
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes

Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical

contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving. Techniques for the prevention and control of these impacts include:

- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic;
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle;
- Ensuring moving equipment is outfitted with audible back-up alarms;
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

Dust

- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements;
- PPE, such as dusk masks, should be used where dust levels are excessive

Other Site Hazards

Construction and decommissioning sites may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms, which should be prevented through the implementation of projectspecific plans and other applicable management practices, including:

- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition;
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements prior to dismantling or demolition including, for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury;
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection.

General Site Hazards

Projects should implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning. Risks may arise from inadvertent or intentional trespassing, including potential contact with hazardous materials, contaminated soils and other environmental media, buildings that are vacant or under construction, or excavations and structures which may pose falling and entrapment hazards. Risk management strategies may include:

- Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas

depending on site-specific situations, including fencing, signage, and communication of risks to the local community;

- Removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials

Traffic Safety

Construction activities may result in a significant increase in movement of heavy vehicles for the transport of construction materials and equipment increasing the risk of traffic-related accidents and injuries to workers and local communities. The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of procedures prescribed for Traffic Safety.

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ANNEXURES

ANNEXURE I: List of Contacted Stakeholders

**LIST OF STAKEHOLDERS FOR ESMP PROJECT
UNDER KATSINA STATE NEWMAP**

FEDERAL GOVERNMENT:

Federal Ministry of Environment, Abuja

- (1) The Hon. Minister Hon. Ibrahim Usman Jibril
- (2) Permanent Secretary Dr Shehu Mahmud
- (3) Director, Environment Assessment Department Usman Ahmed

National Environmental Standards and Regulations Enforcement Agency (NESREA)

- (4) Director General/CEO - Dr. Lawrence Chidi Anukam
- (5) Katsina Zonal Controller, Zonal Comptroller, Katsina State.

STATE GOVERNMENT

- (1) Permanent Secretary, Environment; Alhaji Isyaku Masari
- (2) Director, Ecology and Erosion Control Alh. Abubakar Muhammad Gege
- (3) Permanent Secretary, Land and survey; HAJIYA TALATU NASIR
- (4) Director Lands; ALHAJI SANI NADADA
- (5) Permanent Secretary, Water Resources; Alh. Ubale Aburrahman
- (6) Director, Water Resource;
- (7) Permanent Secretary, Works; Engr. HAFIZ WALI
- (8) Director Civil; Engr Yakubu Muhammad
- (9) Permanent Secretary, Agriculture;
- (10) Director, Agriculture; ALHAJI BELLO MUHAMMAD FUNTUA

THE TRADITIONAL RULERS

- (1) SARKIN MASKA HAKIMIN FUNTUA
ALHAJI IDRIS SAMBO
- (2) SARKIN AREWA HAKIMIN JIBIA
- (3) MAGAJIN GARIN KATSINA, HAKIMIN KATSINA
ALHAJI AMINU ABDULMUMINI KABIR USMAN
- (4) GALADIMAN KATSINA, HAKIMIN MALUMFASHI
ALH. JUSTICE SADIQ MAHUTA

COMMUNITY PERSONS:

- (1) Katsina Community Members
- (2) Malumfashi Community Members
- (3) Funtua Community Members
- (4) Jibia Community Members

NATIONAL ASSEMBLY MEMBERS, ABUJA

Distinguished Senators

- (1) SENATOR BELLO MANDIYYA, FUNTUA ZONE
- (2) SENATOR KABIR BARKIYA, KATSINA ZONE

Federal House of Representatives

- (1) ALHAJI MUNTARI DANDUTSE, FUNTUA/DANDUME
- (2) ALHAJI IRO ISANSI, KATSINA CONSTITUENCY
- (3) ALHAJI BABANGIDA IBRAHIM, MALUMFASHI/KAFUR

(4) ALHAJI SADA SOLI JIBIA, JIBIA/KAITA

KATSINA STATE HOUSE OF ASSEMBLY

1. HON, ALHAJI IBRAHIM SAEED, MALUMFASHI
2. HON, ALHAJI ABUBAKAR MUHAMMAD, FUNTUA
3. HON, ALI ABU ALBABA, KATSINA.

LOCAL GOVERNMENT AREAS:

- (1) ALHAJI LAWAL SANI FUNTUA, FUNTUA L.G.A.
- (2) ALHAJI AMINU WAZIRI, MALUMFASHI L.G.A.
- (3) ALHAJI ABUBAKAR BAKO, KATSINA L.G.A

NON-GOVERNMENTAL ORGANIZATIONS:

FAITH BASED ORGANISATIONS (FBO)

JIBWIS, KATSINA STATE

MUNAZZAMATU, KATSINA STATE

FITYANUL ISLAM, KATSINA STATE

CAN, KATSINA STATE

HIGHER LEARNING INSTITUTIONS:

- 1) UMARU MUSA UNIVERSITY, KATSINA
- 2) FEDERAL UNIVERSITY, DUTSINMA
- 3) FEDERAL COLLEGE OF EDUCATION, KATSINA
- 4) ALQALAM UNIVERSITY, KATSINA
- 5) SCHOOL OF NURSING AND MIDWIFERY, KATSINA
- 6) HASAN USMAN KATSINA POLYTECHNIC, KATSINA

ONE PASSPORT-SIZE
PHOTO OF
RESPONDENT
REQUIRED

QUESTIONNAIRE NUMBER	
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**KATSINA STATE NIGERIA EROSION & WATERSHED MANAGEMENT
PROGRAMME (KTS-NEWMAP)
FUNTUA, MALUMFASHI, KATSINA AND JIBIA STORMWATER
DRAINAGE AND DAM INTERVENTION PROJECTS
[Rehabilitation and Redevelopment of Stormwater Drainages & Dam**

NAME OF COMMUNITY: _____

DATA COLLECTION CONSENT & SURVEY FORM

CONSENT:

We are conducting/preparing an Environmental and Social Management Plan (ESMP) for the above stormwater drainage and dam projects under the Katsina State Nigeria Erosion and Watershed Management Programme (NEWMAP). The data collected will help to assess the environmental and social impacts that may occur as a result of these drainage rehabilitation and redevelopment projects. To enable us achieve this objective, this socioeconomic survey and your voluntary consent for the survey are required.

Respondent Name: _____ **Signature:** _____

Gender		Phone Number(s)					
Your Village/ Community		No of years lived in area?:		Do you desire to see this project happen?			
				YES	NO		
No. of Persons in Your Household:	MALE		FEMALE		Highest Education	NS/F/S/UG/G/PG	
What is your age range?	0-21 yrs	22-45 yrs	46-60 yrs	61-70 yrs	Above 70 yrs		
Are you married?	YES	NO	Your Occupation				
Household Age Distribution	0-21 yrs	22-45 yrs	46-60 yrs	61-70 yrs	Above 70 yrs		
Household Educational Distribution	No School (NS)	FSLC (F)	SSCE (S)	Undergrad (UG)	Graduate (G)	Post Grad (PG)	
Household Marital Status:	Child	Single	Married	Widowed	Separated	Divorced	
Household Occupational Distribution:	Student	Farmers	Daily Labor	Civil Servant	Trader/ Business	Industrial Worker	Unemployed
Monthly Household Income:	Below N21,000	N21,000- 30,000	N31,000- 45,000	N46,000- 60,000	N60,000-120,000	Above N120,000	
How will this project affect you, your household or your community?	Improve Movement	Increase Land Value	Improve Trading	Improve Communication	Others		
What was the frequent illness(es) in your family in the past one year?							
Where does your family seek medical treatment from?			Hospital	Pharmacy/ Chemist	Native Drugs	Self-Medication	
How far is this facility from your place?			Walking Distance	Upto 2.0km	Over 2.0km	Outside Community	

INTERVIEWER: (Full Names)		PHONE NO.			
SIGNATURE		DATE:	D:	M:	2018

Household Composition and Personal Information

Household Members	Surname	Other Names	Relationship With H.H	Gender	Age	Disability	Educational Level	Occupation
Head of Household								
Spouse								
Member 1								
Member 2								
Member 3								
Member 4								
Member 5								
Member 6								
Member 7								

Disability = Blind-1; Crippled-2; Mentally Disabled-3; Physically Challenged-4, Other-5
Relationship = Self -1; Wife-2; Son/Daughter-3, Nephew/Niece-4, Son-in-law/Daughter-in-law-5, Grand Child-6, Parent-7, House Help-8, Others-9
Marital Status = Single-1, Married-2, Widow-3, Widower-4, Divorcee-5, Separated-6, Single Parent-7.
Literacy Level = Illiterate-1, Primary School-2, Secondary School-3, Undergraduate-4, Graduate-5, Post Graduate-6, Others-7.
Occupation = Crop Farming-1, Animal Husbandry-2, Service Provider-3, Civil Servant-4, Craftsmanship/Artisanship-5, Trade/Business-6, Industrial Worker-7, Daily Wage Labour-8, Other-9.

WHAT IS LIKELY TO BE AFFECTED BY THE PROJECT?

Structure-1; Land-2; Structure and Land-3; Cash Crop-4; Others-5
(specify).....

Years of Occupation of Affected Property (if applicable):.....Years

STATUS OF PROPERTY USER: A) Title holder; B) Tenant; C) Non-Title Holder; D) Govt; E) Squatter

Affected Structure Details:

Type of Use	Monthly Rent	Utility Connections	Distance to Drainage Edge (m)	No of Rooms	Floor Level	Total Area (m2)	Type of Construction		
							Roof	Wall	Floor

Type of Use = Residence-1; Commercial-2; Residential-cum-Commercial-3; Animal Shed/Poultry-4; Other (specify)-5.....
Type of Construction: Wall = Mud-1, Thatched-2, Brick-3, Plank-4, Zinc-5; **Roof** = Zinc/Asbestos-1; RCC-2; Thatched-3; Tiles-4
Floor = Cement-1; Mud-2; Tiles-3; **Floor Level** = Bungalow-1, Storey Building-2; **Utility Connection** = Electricity-1; Water-2; Phone-3

AFFECTED LAND DETAILS

SIZE OF AFFECTED LAND.....

TYPE OF LAND..... (Agriculture-1; Residential-2; Commercial-3; Barren-4; Grazing Land-5)

If Agriculture, is land Wet-1; Dry-2; Other-3

Crops grown on land?

Immovable assets likely to be affected: Trees.....; Orange.....; Mango.....; Apple.....; Others.....

In your view, what is the yearly monetary benefit you gain from the land? .N.....

ANNEXURE III: Summary of Applicable World Bank Safeguard Policies

The World Bank safeguard policies are designed to help ensure that projects proposed for Bank financing are environmentally and socially sustainable, and thus improve decision-making. The Bank has ten safeguards policies as listed below:

- OP 4.01 Environmental Assessment;
- OP 4.04 Natural Habitats;
- OP 4.09 Pest Management;
- OP 4.11 Physical Cultural Heritage;
- OP 4.12 Involuntary Resettlement;
- OP 4.10 Indigenous People;
- OP 4.36 Forests;
- OP 4.37 Safety of Dams;
- OP 7.50 Projects on International Waterways;
- OP 7.60 Projects in Disputed Areas

The environmental and social safeguard policies of World Bank triggered and applicable in this Malumfashi subproject include OP 4.01 and OP 4.12. These policies are summarized as follows:

Environmental Assessment (EA) (OP 4.01):

An EA is conducted to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. Any World Bank project that is likely to have potential adverse environmental risks and impacts in its area of influence requires an EA indicating the potential risks, mitigation measures and environmental management framework or plan.

Physical Cultural Resources (OP 4.11):

The Bank seeks to assist countries to manage their physical cultural resources and avoid or mitigate adverse impact of development projects on these resources. Although this policy is not triggered for this subproject, there are possibilities for the existence of and other cultural relics within the project area. The requirements for chance finds of such relics shall apply during the construction works.

Involuntary Resettlement (OP 4.12):

Key objectives of the World Bank's policy on involuntary land acquisition are to avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; assist displaced persons in improving their former living standards, income earning capacity and production level, or at least in restoring them; encourage community participation in planning and implementing resettlement; and provide assistance to affected people regardless of the legality of land tenure. The policy covers not only physical relocation, but any loss of land or other assets resulting in relocation, or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihood whether or not the affected people must move to another location. When the policy is triggered, a Resettlement Action Plan (RAP), must be prepared. An abbreviated plan may be developed when less than 200 people are affected by the project. In situations, where all the precise impacts cannot be assessed during project preparation, provisions are made for preparing a

Resettlement Policy Framework (RPF). The RAP/RPF must ensure that all Bank's policy provisions detailed in OP 4.12 are addressed particularly the payment of compensation for affected assets at their replacement cost.

Disclosure Policy (OP 17.50).

This policy supports decision making by the Borrower and Bank by allowing the public access to information on environmental and social aspects of projects. Mandated by six safeguard policies that has specific requirements for disclosure in country (Before project appraisal in local language and in English) and the World Bank Website (Before project appraisal in English). Documents can be in draft but must meet WB standards.

ANNEXURE IV: General Environmental Management Conditions For Construction Contracts/Civil Works.

Contract Specifications for Contractor

1.0 General

- a. All Environmental and Social (E&S) safeguards associated with the contract shall be complied with by the contractor. The Contractor shall also update himself about such issue in the ESMP, and prepare his work strategy and plan to fully take into account relevant provisions of the ESMP.
- b. The Contractor shall develop a plan of work indicating all Environmental and Social safeguards at the various stages and indicate the period within which site will be maintained to it's original state after completion of works to ensure that significant E&S safeguards have been addressed appropriately.
- c. The Contractor shall adhere to the proposed plan implementation schedule and the monitoring plan to ensure effective feedback of monitoring information to the SPMU Project Engineer (PE).
- d. The Contractor shall implement all measures to avoid undesirable adverse environmental and social impacts wherever possible, restore site offices to acceptable standards, and abide by all environmental performance requirements specified in the ESMP

2.0 Dust Mitigation Measures

- a. The contractor shall minimize the effect of dust on the surrounding environment resulting from site clearing, vibrating equipment and temporary access roads.
- b. During the rehabilitation project, the contractor shall carry out proper and efficient measures, such as water dousing, whenever necessary to reduce the dust nuisance, and to prevent dust originating from the operations.

3.0 Noise Due to Construction Activities

The contractor shall ensure the noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

4.0 Waste Management

- a) Construction waste shall not be left in stockpiles along the road, but removed and disposed of/or reused where needed.
- b) All waste shall be segregated into organic waste and plastic and glass. The organic waste will be composted near the site office to enrich the soil while plastics and glass will be taken to the district dump sites

- c) All sanitary facilities (e.g. garbage collection and disposal, drinking water facilities, etc.) shall be provided by the contractor in site offices or project sites.

5.0 Water Resource Management

- a) No construction water containing spoils or site effluent, especially cement, oil and fuel, shall be allowed to flow into natural water drainage courses.
- b) The contractor shall take all possible steps to prevent pollution of streams and other water supplies.
- c) Entry of runoff water to the site shall be restricted by constructing diversion channels or culverts to reduce the potential of soil erosion and water pollution.
- d) Waste water from washing out of equipment shall not be discharged into water courses.

6.0 Material Excavation and Deposit

Vegetation clearing shall be restricted to the area required for safe operation of the rehabilitation work. Vegetation clearing shall not be done more than two weeks in advance of rehabilitation.

7.0 Contractor's Environment and Social Management Plan (ESMP)

- a) Within 6 weeks of signing the Contract, the Contractor shall prepare a work plan to ensure the adequate management of E&S aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an E&S safeguards for the works. The Contractor's work plan will serve two main purposes:
- i. For the Contractor, for internal purposes, to ensure that all measures are in place for adequate E&S management, and as an operational manual for his staff.
 - ii. For the Client, supported where necessary by SE, to ensure that the Contractor is fully prepared for the adequate management of all E&S safeguards issues.
- b) The Contractor's E&S document shall provide at least:
- A description of procedures and methods for complying with these general environmental and social conditions, and any specific conditions specified in the ESMP;
 - A description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
 - A description of all planned monitoring activities and the reporting thereof; and
 - The internal organizational, management and reporting mechanisms put in place.

8.0 Health and Safety

a) In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of HIV/AIDS.

b) Adequate road signs to warn pedestrians and motorists of rehabilitation activities, diversions, etc. shall be provided at appropriate points.

9.0 Reporting

The Contractor shall prepare monthly progress reports to the SPMU on E&S monitoring with these general conditions and the project E&S safeguards. It is expected that the Contractor's reports will include information on:

- E&S management actions/measures taken, including approvals sought from SMENV, PE and FME
- Problems encountered in relation to E&S aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to E&S aspects; and
- Observations, concerns raised and/or decisions taken with regard to E&S management during site meetings.

10.0 Cost of Compliance

It is expected that compliance with these conditions is already part of standard of good workmanship and state-of-the-art as generally required under this Contract. The item "Compliance with Environmental and Social Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable E&S impact.

ANNEXURE V: Minutes & Photos of Meetings with Malumfashi Town Community

Consultant Meetings with Various Strata of Malumfashi Community

Minutes of Consultant Meeting with Malumfashi District Head

MINUTES OF MEETING HELD WITH THE MALUMFASHI DISTRICT HEAD AT THE PALACE OF THE DISTRICT HEAD (JUSTICE SADIZ MUHUTA)

ITEM	DESCRIPTION
1. Project:	Katsina State NEWMAP ESMP
2. Community:	Malumfashi
3. Date:	July 28, 2019.
4. Language of Communication:	Hausa and English
5. Introductions and Protocols:	<ul style="list-style-type: none">The meeting commenced at about 3:30pm with an opening prayer by Aminu Garba. It was anchored by the NEWMAP communicator Mr. Zaharadeem Sani who later introduced himself and the team of consultants and the Katsina NEWMAP members of staff to the district head Justice Sadiz Mahuta who was unavoidably absent but, was represented by Dr. Zayyan Garba. He started by briefing the district head and the meeting on the purpose of the visit by the team as it concerns ESMP of the proposed Malumfashi storm water control project. He said that the exercise will be done before the proper project will take place in order to look at the environmental and social effect of the project and proffer a management plan.
6. Remarks of Consultant	<ul style="list-style-type: none">The principal consultant Dr. Odili Ojukwu introduced him and his team members and said they have come here for Malumfashi storm water control. He thanked and acknowledged the district head for his convivial to the team. The consultant continued by briefing the district head on the purpose of visiting to deliver an ESMP of the proposed Mulunfashi Storm water control project. He made the district head and the people to understand that this will be done by looking at the World Bank requirement and every order laws necessary to be recognized in order to take care of the safe guard against anything that will make the project not to be successful. He persistently explains the need to bring the people closer to the project for a detailed and all-inclusive project. He informed the people that the project is a community owned project and so the people have to take possession of the project from the commencement to the finish for a successful and sustainable project. He thanked everyone and pleaded with the district head to mobilize and inform everyone in the community the need for full involvement in the exercise. He explained that his team of consultants has come to inform the district of their reason for being in his community which is to do ESMP for the proposed storm water controll in order to make sure that all the effect of the project are identified and predictable as it concerns pollution of all kinds. At the end of this exercise, the group will make sure that the project does not affect the people negatively instead it will improve the living standard of the community.Dr. Odili Ojukwu informed the district head that the project will involve numerous data collection which ranges from water sample, soil sample and air samples for baseline information. Other data include geological data and socioeconomic data collection of the members of the communities among others. He made the district head to understand that five enumerators will

ITEM	DESCRIPTION
	<p>be mobilized for at least two days to carry out the socioeconomic data collection in order to know how the project will affect the people while every other forms of data collection like air sample, water sample and soil sample will be done at the field. He pleaded for cooperation of the community and support of the district head during the exercise. He explained that the exercise for socioeconomic data collections will start at 9am and ends at 3pm every day and every one that will be captured will come with his or her photocopied ID card including one passport photograph for proper documentation hence, the consultant's recommendation. The consultant's recommendation will be protective of the community and will be used by the contractor because is going to be part of the contract he avowed.</p> <ul style="list-style-type: none"> • The principal consultant briefed the district head and other attendees that there will be community meeting tomorrow which will involve the entire members of the community. He explained to the district head that according to World Bank standard; a project of such involves the peoples view through what we call a Focal Group Discussion which will involve various groups like men, women and youths in order to look at their concerns towards the proposed Malumfashi storm water control project. We are very culture sensitive to make sure that what we do is in line with the culture of the community he affirmed.
<p>7. The remarks of the District Head (Justice Sadiz Muhuta)</p>	<ul style="list-style-type: none"> • The district head welcomed the principal consultant and his team. He thanked the group and assured them of his support in particular as well as the community support in general during the entire exercise. He said that the community will benefit from the project especially when the storm water is properly controlled. He informed the team that about three wards will be involved in the exercise. Finally he wished the team all the best throughout their stay in his community.
<p>8. Vote of thanks</p>	<p>Mr. Zaharadeem appreciated the district head for a warm welcome and audience given to the team.</p>
<p>9. Closing</p>	<p>The meeting rose at about 4:08pm with a payer by Aminu Garba</p>

Photos of Meeting with Malumfashi District Head



Minutes of Malumfashi Community Meeting

MALUMFASHI STORM WATER CONTROL PROJECT MINUTES OF CONSULTATION MEETING WITH MALUMFASHI COMMUNITY AT THE DISTRICT HEAD'S PALACE

ITEMS	DESCRIPTION
1. Project:	Katsina State NEWMAP: ESMP
2. Name of Community:	Malumfashi
3. Date:	July 29, 2019
4. Language of Communication:	English and Hausa
5. Protocols and Introductions:	<ul style="list-style-type: none"> The sensitization exercise started with a courtesy call on the district head where the meeting took place. The meeting commenced at about 10:40am with a brief introduction of the members of consulting firm OTG Enviroengineering Ltd led by Dr. Odili Ojukwu and staff of the SPMU by the district head to the community. The district head was unavoidably absent but, represented by Dr. Zayyan Garba. He urged the community members to give the team of consultants audience. He went further to brief them on the proposed Malumfashi storm water control project.
6. Remarks of the SPMU:	<ul style="list-style-type: none"> Mr. Azukar the communication officer (CO) spoke on behalf of the SPMU to formally inform the community members on the purpose of the meeting as it concerns the proposed Malumfashi storm water control project. He stated that the project will bring an end to menace of storm water in the community. The CO reminded the attendees that the ESMP will be done by the consultants before the actual project to better the peoples live. He intimated them that SPMU is expecting the support and cooperation of an appreciative community in the on-going exercise.
7. Remarks of the Principal Consultant:	<ul style="list-style-type: none"> Dr. Odili Ojukwu, the principal consultant at OTG spoke on behalf of the consultants. He first introduced the team of specialists and other support staff from OTG. He informed the attendees that it was the challenges of the storm water in the community with its menace that precipitated the meeting. The consultant made the community to understand that the ravaging impacts of the storm water will be dealt with by the government under the NEWMAP, with funding assistance from the World Bank. People were informed by the consultant that the ESMP consultancy is aimed at finding out and documenting the impacts of the proposed storm water control project on the elements of the bio-physical and socio-economic environment of the Malumfashi storm water corridor, and to recommend appropriate remediation in line with the World Bank social safeguard policies. The principal consultant informed the community that there will be a two-day socioeconomic data collection in the community which will start by tomorrow being July 30, 2019. He intimated the community to come out with their photocopy of their ID cards

	<p>and one passport photograph for documentation exercise. He said that the exercise will be starting at 9am everyday to 3pm.</p> <ul style="list-style-type: none"> The community was further advised to take full ownership of their environment and the project. This means that they should participate fully in all the stages of the proposed Malumfashi storm water control project, and avoid unnecessary conflicts and disaffections to ensure a successful and sustainable storm water control project. He informed the community that there will be a focus group discussion for elders, women and youths in the community. This would be held in due course to ascertain their specific perspectives and perceptions about the Malumfashi storm water control project.
8. Community Perceptions about the Project:	<ul style="list-style-type: none"> The proposed Malumfashi storm water project is a good development base on the fact that the community will be better after the civil work the district head affirmed. He promises that the community will surely see the project as their own while they give full support to the consultants for a more successful and sustainable project.
9. Vote of Thanks/Closing:	<ul style="list-style-type: none"> Vote of thanks was formally given by Mr. Zaharadeen Sani after which the meeting ended at 12pm.
10. Attendees:	<ul style="list-style-type: none"> The meeting was attended by 36 persons

Attendees to the Consultant Meeting with Malumfashi Community

NIGERIA EROSION AND WATERSHED MANAGEMENT PROJECT (NEWMAP)
MALUMFASHI STORMWATER CONTROL PROJECT
CONSULTANT CONSULTATIVE MEETING WITH COMMUNITY

JULY 29, 2019

ATTENDANCE SHEET

S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
1	Dr. Zayyan Gamba	M	DH Rep	08056572499	[Signature]
2	AH- Murtala Danmatten	M	Maggaji Fayansa	080 28151063	[Signature]
3	Aminu Garba	m	S/Alcanti	07067365519	[Signature]
4	All. Mustapha Shehu	M	QWAMUISAWA	07089018826	[Signature]
5	Ah. Isah Mahamad.	M.	K/Fada	09061162291	[Signature]
6	A. SAMINU GARBA	M	QWAMUISAWA	0818304958	[Signature]
7	A. UMMAR FARUK	M	K/FADA	08188470890	[Signature]
8	Musa Sarlani	-	-	07083517892	[Signature]
9	Zviadani Ah	M	K/Feda	07063323053	[Signature]
10	Umekoto Chirela	F	OTG Consultant	08037739595	[Signature]
11	Daniel ThankGod	M	OTG Consultant	07039661173	[Signature]
12	Ibeneme Grace	F	OTG Consultant	08039661174	[Signature]
13	Dr. Olati Gureu	M	OTG Consultant	08033385090	[Signature]
14	Muhammad Chale	M	"	08037739592	[Signature]

Photos of Malumfashi Community Meeting

MALUMFASHI COMMUNITY MEETING



Minutes of Focus Group Discussions (FGD) with Malumfashi Men

REPORT OF THE FOCUS GROUP DISCUSSIONS (FGD)

ITEMS	DESCRIPTION
1. Project:	Katsina NEWMAP: ESMP
2. Title	Men Focus Group Discussion (FGD)
3. Community:	Malumfashi
4. Date:	July, 29, 2019
5. Language of Communication:	Hausa
6. Introductions:	<ul style="list-style-type: none"> The meeting started at about 10:30 am.at the foregrounds of the District head's palace. (Kofar Fada). It followed immediately after the community sensitization which was held at a conference hall in the palace. On the 29th of July 2019.
7. Remarks of the Consultant:	<ul style="list-style-type: none"> The consultant firm- OTG- represented by NASIRU UMAR – the Sociologist made the following remarks: He explained to the people in attendance the likelihood of temporary disruptions of livelihood by the proposed project work on the flood prone corridors. The activity may affect the physical environment and socio-economic lives of the community. The purpose of the ESMP consultancy is to sensitize and mobilize support for the project as well as document the concerns of the community and assure the affected community that measures will be taken to safeguard their interests and assuage the feelings of the community while the project ensues. He reiterated the emphasis of the lead consultant at the community sensitization meeting of the importance of Women participation and involvement in the project. He made them aware that companies working with heavy equipment are likely to discharge pollutants like dust, smoke, noise and vibrations. In addition to these there may be traffic disruptions and hold ups and people who eke out a living along the corridor may experience a temporary shortfall in their revenues, but he assured that all these will be reduced to a condonable level. He appealed to the community to take ownership of the project when completed and guard against its deterioration or vandalism.
8. Remarks of the men:	<ul style="list-style-type: none"> The concerns of the men revolved around their farmlands, reconstructed houses after the last floods, lands and restlessness. <p>Assets along the flood corridor: These include farmlands, shops, lands and structures.</p> <p>Impacts of the flood and erosion: The Men mentioned the following among the impacts of flood on their lives.</p> <ul style="list-style-type: none"> - Flooding and displacements of homesteads. - Destruction/loss of farmlands - Disruption of family life - Loss of means of livelihood <p>Expected benefits from remedial works: These include:</p> <ul style="list-style-type: none"> - Peace of minds; - Restoration of homesteads and farmlands; - Increased life expectancy. - Restoration of family life <p>Expected roles: During the remedial works, Men would:</p> <ul style="list-style-type: none"> - Monitor implementation progress and give feed-back; - Explore income opportunities through sales of food, goods and wares; - Supply their labour (skilled and unskilled); - Help to ensure peace and security.
9. Perceptions of the Project and Questions:	<ul style="list-style-type: none"> The Men thanked everyone who has anything to do with the project. They pledged their full cooperation and are willing to vacate if it comes to that. They however asked questions about compensations

	for properties affected by the project.
10. Response of the Consultant:	<ul style="list-style-type: none"> The consultant responded by assuring them that compensation will be made to those whose livelihood, property and assets fall within the project corridor. The World Bank social safeguard policies will apply. Those who had suffered losses in the past owing to the erosion are not scheduled for compensation. Only those that would be affected by the proposed remedial works as per the engineering design would be compensated.
11. Attendees:	<ul style="list-style-type: none"> The meeting was attended by 26 Men within the age range of 40-70 years, including farmers, traders, civil servants and artisans.
12. Closing:	<ul style="list-style-type: none"> The meeting closed at about 12:30pm.

Attendees to Focus Group Discussions (FGD) with Malumfashi Men

NIGERIA EROSION AND WATERSHED MANAGEMENT PROJECT (NEWMAP)
MALUMFASHI STORMWATER CONTROL PROJECT
FOCAL GROUP DISCUSSION - MEN
COMMUNITY: Malumfashi

JULY 29, 2019

ATTENDANCE SHEET

S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
1	LAMAL ABUBAKAR KADU	M	MALUMFASHI	08086281237	<i>[Signature]</i>
2	AMAS OMAE INAMI	M	ENI LEVAL	07033078349	<i>[Signature]</i>
3	JUMAR KADU	✓	✓	08130697367	<i>[Signature]</i>
4	ABUBAKAR SHEHU	✓	Government/Farm	07037078826	<i>[Signature]</i>
5	ALI SHAMUS KAMARU	✓	✓		
6	MUHAMMAD H. KHAMIS	✓	✓	07039679002	<i>[Signature]</i>
7	MANU G. GAMBO	✓	Government		<i>[Signature]</i>
8	MANU G. AMINU	✓	Tinsindan	88100953823	<i>[Signature]</i>
9	SABIRU KADU GAMBO	✓	QAM S/26		<i>[Signature]</i>
10	JUMAR KADU	✓	Kofar Fara	08068224183	<i>[Signature]</i>
11	OLUWELA THURKUD	M	DTG Consultant	07089661173	<i>[Signature]</i>
12	IBENEME GRACE	F	DTG Consultant	08037605874	<i>[Signature]</i>
13	UMETAPOR CHARLO	F	DTG Consultant	08037739595	<i>[Signature]</i>
14	ABDUL QUMBU	M	DTG Consultant	02033380010	
15	ABDUL K. ABULAS	M	"	08037787562	<i>[Signature]</i>
16					
17					

Minutes of Focus Group Discussions (FGD) with Malumfashi Women

ITEMS	DESCRIPTION
1. Project:	Katsina NEWMAP: ESMP
2. Title	Women Focus Group Discussion (FGD)
3. Community:	Kofar Fada, Malumfashi
4. Date:	July 29, 2019.
5. Language of Communication:	English and Hausa
6. Introductions:	<ul style="list-style-type: none"> • The meeting started at about 12:30pm. The venue was an open space close to the Unguwar Sordangi (bridge). The meeting was a follow-up to the general community sensitization exercise held at the house of the District head in the early hours of July 29, 2019.
7. Remarks of the Consultant:	<ul style="list-style-type: none"> • The consultant firm-OTG Enviroengineering Ltd, was represented by Mrs. Ibeneme, Grace- the rural development specialist. • She thanked the women for the massive and prompt response to their invitation. She told them that the meeting is a community consultation which is for the purpose of the NEWMAP's Environmental Social Management Plan (ESMP). She disclosed to them that ESMP is carried out before the commencement of civil works in order to know the environmental and social impact of the proposed project on the community. • She explained to the attendees that the proposed civil works on the storm water drainage corridors are likely to have adverse impacts on the elements of the physical environment and socio-economic lives of the community, of which there is need to recommend appropriate mitigation and compensatory measures to deal with these impacts; which is the main purpose of the ESMP consultancy. • She urged the women to take the project as their own in order for the project to be sustained, stating that it is a community based project which is to be managed by the people. She appealed to the women to render their full support to the proposed project to ensure its sustainability. She told the women that World Bank's aim is to leave the people better than they were at the end of the project. • She informed them of the socioeconomic survey and urged them to ensure that adequate information is provided in order to produce a credible report. She then informed them that members of the team would be visiting their community to elicit information concerning some socio-economic issues; and urged them to grant the team audience with utmost sincerity as the information provided would be used for the purpose of the project. • Women-specific perspectives and their perception about the project are considered important, hence the need for the meeting. She then encouraged them to express their concerns and ask questions in relation to the proposed project. • She mentioned some likely adverse impacts of the project and the corresponding mitigation measures for the knowledge and benefit of the attendees. • She urged the women to sensitize and caution their children especially their daughters on sexual issues in order to avoid gender based violence and other related issues which could affect the project.
8. Remarks of the Women:	<ul style="list-style-type: none"> • Mrs Hadiza Kahalid made a remark on behalf of the women. She welcomed the delegation to their community, appreciated the World Bank and other actors involved and assured them of their support. • Their remarks were centered on the following issues: Assets along the project corridor:

	<ul style="list-style-type: none"> - Farms - Buildings - Economic trees etc. <p>Impacts of the menace:</p> <ul style="list-style-type: none"> - Flooding and displacements of homesteads. - Destruction/loss of farmlands - Restlessness <p>Expected benefits from the civil works:</p> <ul style="list-style-type: none"> - Improved farming activities - Peace of minds; - Restoration of homesteads and farmlands; - Provision of access roads. <p>Expected roles of the women during the civil works:</p> <ul style="list-style-type: none"> - Help to maintain the project; - Explore income opportunities through sales of food and sundry items; - Supply their labour (skilled and unskilled); - Help to ensure peace and security.
9. Women's perceptions of the Project and Questions:	<ul style="list-style-type: none"> • The women were indeed pleased with the proposed project. Speaking on behalf of the women, Mrs. Sadatu Abubakar said that they have since been praying to God for help. She noted that they are indeed grateful that the World Bank has heard their plights and has finally come to their aid. • Mrs Karimatu Bala also stated that the women are pleased with the intervention. She explained that they hardly ever have rest of mind whenever the rainy season starts. She noted that this is indeed a welcome development of which they are well pleased. She further said that since the benefit of the civil works is for them, they won't have issues with the environmental impact that might spring forth during the civil works. • They pledged their support, prayers and cooperation and assured the consultants that they will ensure the project is maintained and sustained. Only one question was asked based on the explanations and remarks: <ul style="list-style-type: none"> - Will those who have farms located along the project corridor be compensated?
10. Response of the Consultant:	<ul style="list-style-type: none"> • Yes, there will be due compensation for those whose farms, assets and sources of livelihoods would be affected adversely by the civil works but that is for the Resettlement Action Plan (RAP) consultant to handle not ESMP consultant.
11. Attendees:	<ul style="list-style-type: none"> • The meeting was attended by 31 women including the elderly.
12. Closing:	<ul style="list-style-type: none"> • The meeting rose at about 2:00pm.

Attendees to Focus Group Discussions (FGD) with Malumfashi Women

NIGERIA EROSION AND WATERSHED MANAGEMENT PROJECT (NEWMAP)
MALUMFASHI STORMWATER CONTROL PROJECT
FOCAL GROUP DISCUSSION - WOMEN
COMMUNITY: Malumfashi
JULY 29, 2019

ATTENDANCE SHEET

S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
1	Goma Babba	F	malumfashi		<i>[Signature]</i>
2	H/Lyidi Kalir	F	Gwamutsawo	08162123287	L
3	Binta Bello	F	Gwamutsawo	08141157302	B
4	Usani Mott.	F	Gwamutsawo	08130864347	
5	Safiya Habibu	F	Gwamutsawo	NIL	
6	Zenya Mott.	F	Gwamutsawo		
7	Fadma Shehu	F	Gwamutsawo	08064970316	<i>[Signature]</i>
8	Zainab Tukur	F	Gwamutsawo	09061597076	
9	Kyrima Tukur	F	"	09088242390	
10	Zainab Aminu	F	"	07036513867	
11	Hadiya Ali	F	"	07063839192	
12	Asiya Saminu	F	"	NIL	
13	Asiya Tijjani	F	"	08148368932	
14	Saratu Tijjani	F	"	0	
15	Lami Ndani	F	"		
16	Binta Garba	F	"		
17	Klatisa Kalir	F	"	08137985393	

**FGD - WOMEN ATTENDANCE
MALUMFASHI**

S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
18	Hajiya Binta	F	Gwamutsawo	08134264306	<i>[Signature]</i>
19	Hajiya Marwa	F	Gwamutsawo	08067349869	<i>[Signature]</i>
20	Mariya Idris	F	"	07066810949	<i>[Signature]</i>
21	Waqila Ibrahim	F	"	081-42886298	<i>[Signature]</i>
22	Hadiya Babanji	F	"	081-32870161	<i>[Signature]</i>
23	Safiya Mansir	F	"	09082050348	<i>[Signature]</i>
24	Asama U Sani	F	"	09075198168	<i>[Signature]</i>
25	Hadiya Bishiri	F	"	081651647197	<i>[Signature]</i>
26	Safiya Lawal	F	"	08130697367	<i>[Signature]</i>
27	Amina Usav	F	"		<i>[Signature]</i>
28	Binta Abubakar	F	"	08060689491	<i>[Signature]</i>
29	Hajiya ASU	F	"	08101021230	<i>[Signature]</i>
30	Mariam mohammed	F	"	09063736550	<i>[Signature]</i>
31	Ibenene Grace	F	OTC consultant	0803960879	<i>[Signature]</i>

Minutes of Focus Group Discussions (FGD) with Malumfashi Youths

ITEMS	DESCRIPTION
1. Project:	Katsina NEWMAP: ESMP
2. Title	Youth Focus Group Discussion (FGD)
3. Community:	Kofar fada, Malumfanshi
4. Date:	July 29, 2019.
5. Language of Communication:	English and Hausa
6. Introductions:	<ul style="list-style-type: none"> The meeting started at about 11:15am. The venue was the compound of the district head Dr. Zayad Garba. The meeting was a follow-up to the general community sensitization exercise held at the open space in front of the district head's palace on July 29, 2019.
7. Remarks of the Consultant:	<ul style="list-style-type: none"> The consultant firm-OTG Enviroengineering Ltd, was represented by Mr. Oduhie, ThankGod - the social development expert. He explained to the attendees that the proposed remedial works on the storm water drainage corridors are likely to have adverse impacts on the elements of the physical environment and socio-economic lives of the community. There is therefore the need to recommend appropriate mitigation and compensatory measures to deal with these impacts; and this is the main purpose of the ESMP consultancy. Youths constitutes the workforce of any society and if such energies are not harnessed appropriately to useful engagements, could result to restiveness, social vices and insecurity in the community. Therefore, Youth-specific perspectives to the study and their perception about the project are considered important. Hence the need for the meeting. He mentioned the following likely adverse impacts and the corresponding mitigation measures for the knowledge and benefit of the attendees. <ul style="list-style-type: none"> Dusts: Spray water to limit dusts Loss of topsoil and vegetation: Limit work areas and operation vehicle movement routes. Noise: By retrofitting vehicles with sound-proofing materials. Soil/ground water contamination: By creating limit zones and limiting excavation to desired areas. Traffic disruptions: There will be changes in lanes configuration, and creation/limiting of operational routes. Disruptions to livelihood: Identify and provide best alternatives to prevent disruptions. Pay compensations as the need arises. Sexual risks (HIV/AIDs): Provide sexual awareness campaigns.
8. Remarks of the Youths:	<ul style="list-style-type: none"> The remarks of the attendees are summarized below: <ul style="list-style-type: none"> Ismaila Yusuf a member of the community in his remark thanked the Almighty God for what seemed to be answered prayers. Noting that over the years the community have just been living in fear especially during the periods of rain due to the incessant flooding experienced resulting in destruction of lives and properties. With the advent of the intended project they are rest assured that soon their plight would be over. He added. He went further to state that the youths have welcomed this project and assured the OTG Environengineering Consultant as well as the NEWMAP of their full support for the success of the project.
9. Perceptions of the Project and Questions:	<ul style="list-style-type: none"> The youths were well pleased with the prospect of the intending project. They also expressed readiness to give support in getting the project done as most of them have accepted the project to be their own. They posed two questions: <ul style="list-style-type: none"> Will there be compensation for destroyed livelihoods?

	- What happens to those who suffered losses in the past?
10. Response of the Consultant:	<ul style="list-style-type: none"> In his reply, he noted that, there would be reasonable compensation for those whose lives, assets and livelihoods would be affected adversely by the remedial works; provided they were documented during the census exercise. The World Bank social safeguard policies will apply. Although another consultant on Rap would capture that. We just want to make sure that people and the environment are better off after the project than before the project. Hence, the ESMP Those who had suffered losses in the past owing to the erosion are not scheduled for compensation. Only those that would be affected by the proposed remedial works as per the engineering design would be compensated.
11. Attendees:	<ul style="list-style-type: none"> The meeting was attended by 14 Youths including the elderly, traders, public servants and artisans.
12. Closing:	<ul style="list-style-type: none"> The meeting ended at about 11:45pm.

Attendees to Focus Group Discussions (FGD) with Malumfashi Youths

NIGERIA EROSION AND WATERSHED MANAGEMENT PROJECT (NEWMAP)
 MALUMFASHI STORMWATER CONTROL PROJECT
 FOCAL GROUP DISCUSSION - YOUTH
 COMMUNITY: Malumfashi
 JULY 29, 2019

ATTENDANCE SHEET

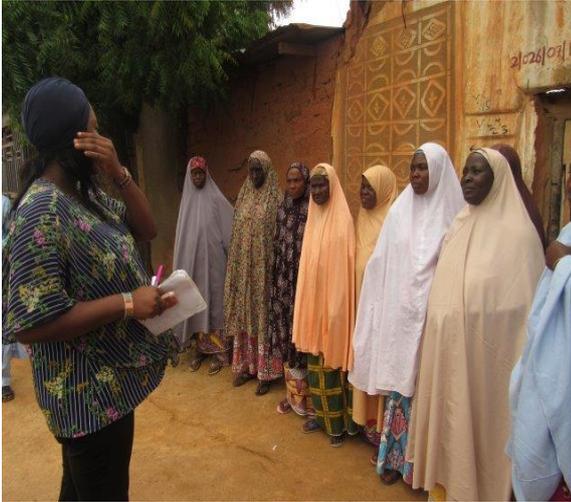
S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
1	Isma'il Adamu	M	M/FSNI	08066619581	
2	Abakim Yusuf	M	M/FGZI	07039504700	
3	Bahari Abdullahi	M	"	08061595419	
4	Abdullahi, Isah	M	MLF	08146146048	
5	Alhaji Ahmad	M	"	08062728888	
6	Abubakar LSAH	M	MALUMFASHI	07032096216	
7	Jamilu Jami	M	Malumfashi	08038279441	
8	Abubakar Jafar	M	MLP	09030587865	
9	Abdullahi RABICI	M	MLR	09039457360	
10	Sani HARUNA	M	M/F	0909066760701	
11	ISYAKU MUAZU	M	M/FSNI	07665591740	
12	Abdul-hakim Ahmad	M	M/FSNI	08141807778	
13	Odunla Thankgod C.	M	M/Fashi	07039661173	
14					
15					
16					
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Photos of Malumfashi Focus Group Discussions (FGD) Meetings

MALUMFASHI MEN FOCUS GROUP DISCUSSION



MALUMFASHI WOMEN FOCUS GROUP DISCUSSION



MALUMFASHI YOUTH FOCUS GROUP DISCUSSION



Photos of Existing Malumfashi Town Drainage System



ANNEXURE VI: Minutes & Photos of Meeting with FMKJ Projects' Stakeholders

Minutes of Stakeholders Consultation Meeting for the FMKJ Projects

MINUTES OF STAKEHOLDERS' CONSULTATION ON THE DEVELOPMENT OF ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP) ON THE REHABILITATION OF STORM WATER DRAINAGE PROJECTS IN KATSINA, FUNTUA, MALUMFASHI AND JIBIA TOWNS, ORGANIZED BY NEWMAP KATSINA STATE ON AUGUST 8, 2019 AT KATSINA STATE SECRETARIAT CHAMBER.

ITEMS	DESCRIPTION
1. Project:	Katsina NEWMAP: ESMP
2. Title	Stakeholders' Consultation on ESMP for FMKJ Projects
3. Community:	Funtua, Malumfashi, Katsina and Jibia (FMKJ)
4. Date:	August 8, 2019.
5. Language of Communication:	English and Hausa
6. Introductions:	<ul style="list-style-type: none">• The meeting started at about 1:00 pm and opened with a prayer by Engineer Abdullahi Sani from Rural Water Supply and Sanitation Agency (RUWASSA). Thereafter Engineer Sanusi from NEWMAP welcomed participants to the occasion and wished for a successful deliberation. He was followed by Halliru Muhammed the representative of the Project Coordinator NEWMAP. He welcomed participants and commended the efforts of the State Government in tackling the menace of erosion and floods in the state. He mentioned the cities where the storm water rehabilitation and reconstruction is scheduled to take place, that is, Katsina, Funtua, Malumfashi and Jibia which is an emergency site.• The permanent secretary ministry of environment represented by the Director Ecological, Abubakar Muhammad Gege conveyed his goodwill message and as chairman technical committee of NEWMAP directed all his technical staff to attend the occasion and make useful contributions for the success of the consultation.• The representative of the Federal Ministry of Environment and Adamu Muhammad Sale who represented the state coordinator NESREA welcomed participants and suggested that EIA be conducted in all projects to be executed.• The state focal NGO, Umar Danladi who spoke before the project engineering unit/ consultant explained that NEWMAP is a community driven development program, whose approach is to allow the community to decide where projects are sighted and be part and parcel of the project. He stresses the need for attitudinal change towards project implementation and ownership. He maintains that, that is why people are involved from the beginning to the end of the project to promote ownership and sustainability. He encouraged people to form community associations and community interest groups to monitor implementation and posited that with the current level of sensitization, Katsina state and the World Bank should be assured of the sustainability of the projects.• Isma'ila Hussaini the project engineering unit/consultant took the floor after the Focal NGO to present using slides a pictorial

	evidence of affected corridors selected for intervention. These include Malumfashi, Katsina, Jibia and Funtua. He explained that the Ministry of Environment has already intervened in some areas of Malumfashi corridor.
7. Remarks of the Consultant:	<ul style="list-style-type: none"> • The ESMP consultant Dr. Odili Ojukwu discussed extensively the role of the ESMP in the projects. He welcomed everyone and promised that the participants' time is going to be well spent as he will give a thorough presentation on the ESMP's role in the project. • He used one slide to paint the ugly picture of the scenario, depicting the nature and danger of floods and erosion in the community. The ESMP is in place to develop the safeguards instruments for the targeted World Bank supported Projects. The consultant narrated how government projects are generally constructed without involving the benefitting community leading to general apathetic attitude by communities towards the projects because of non-involvement. • The fundamental problem he says is sustainability and the missing component is community involvement. It is in line with this that the World Bank insists that the community must recognize and take full ownership of the project even though there is no financial requirement on the part of the community. The OTG is contracted to develop ESMP for Funtua, Katsina, Malumfashi and Jibia storm water drainage and Jibia dam rehabilitation projects. • In developing the ESMP for each of the FMKJ projects, the specific project activities that would impact the environment and the community life are identified and mitigation measures prescribed so as to eliminate such impacts or reduce them to insignificance. • As part of the first steps in the ESMP development process the District Heads and the administrative leadership of the project communities are consulted. The essence of these consultations is to ensure that all hierarchies of the community understand the purpose and scope of the projects and the need for them to take ownership of their respective projects. He pleaded with community members present not to allow contractors or consultants on the projects to cut corners because projects after being executed would become their projects and would become their problems if not properly executed. The success of the projects depends on the interest and commitment of the communities. Consequently, the more questions they ask the more they understand their project. • The consultant concluded by urging the communities to form community associations and site committees to monitor project implementation. He explained that NEWMAP conducts the ESMP and RAP to ensure that project communities are not adversely affected by the implementation of the projects. Any impacts that would affect the peoples' assets and livelihoods would be appropriately compensated for. The bottom-line he says is that the communities should take ownership of projects.
9. Perceptions of the Project and Questions by Stakeholders:	<p>a) Adamu Muhammad Sale representing NESREA asked about compensation, relocation and whether EIA is conducted on corridors before commencement of project.</p> <p>b) Muntari Sani a community participant asked about how the</p>

	<p>public would ensure quality control.</p> <p>c) Abdullahi Muhammad representing the Director Board for Science and Technical Education asked who would channel the grievances of the community in the absence of a representative in government and where the contractor does not employ youth and other community members what happens.</p> <p>d) Mustapha Lawal from the Ministry of Environment asked where uprooted trees would be replaced.</p> <p>e) Umar Ibrahim Darma representing the Member, National Assembly (Katsina Constituency) asked whether the media is going to be used to enlighten the public.</p> <p>f) Mukhtar Muhammad who stood in for the Director Katsina state Waste Management Agency asked about whether there is any provision for corporate social responsibility.</p> <p>g) Yusuf Umar suggested that NEWMAP should ensure people do not build on the corridor - Watershed based solution.</p> <p>h) Dr. Hashim D. Muhammad representing the Permanent Secretary, Katsina State Ministry of Agriculture asked how the community would maintain and sustain the project materially.</p>
10. Response of the Consultant:	<p>a) Compensation and relocation issues are typically addressed in the RAP which is being separately prepared by a different consultant. The EIA, ESIA and ESMP are all safeguard instruments designed to be protective of the environment and the project population. The specific safeguard instrument to be developed for a project depends on the outcome of the creening and scoping process conducted for the project. For the FMKJ projects, it is determined that the ESMP is appropriate to assure the necessary protection of human health and the environment for the proposed projects.</p> <p>b) It is envisaged and anticipated that heightened interest, involvement and commitment on the part of the project communities will ensure quality control on the part of consultants and contractors on the projects.</p> <p>c) As part of the ESMP documentation, a section is usually included on Grievance Redress Mechanism (GRM) which is normally very explicit on how grievances arising from the project are resolved.</p> <p>d) Provisions are made in the ESMP for mitigation of impacts arising from clearance of vegetation or falling of any trees.</p> <p>e) The activities of NEWMAP and the sub-projects are constantly in the media such as this Stakeholders' forum.</p> <p>f) What is required most with the NEWMAP sub-projects is the commitment of communities to exercise ownership of their projects.</p> <p>g) Indeed, land use restrictions are placed in project areas that required the maintenance and care of the communities post project implementation.</p> <p>h) Maintenance and sustainance of the projects materially are addressed in the ESMP as part of the institutional roles of community responsibilities with the support of the appropriate MDAs.</p>
11. Attendees:	<ul style="list-style-type: none"> • The meeting was attended by 70 persons including attendees from the identified stakeholder groups.
12. Closing:	<ul style="list-style-type: none"> • The meeting came to an end at about 3:25pm.

Attendees to FMKJ Projects Stakeholders' Meeting

**NIGERIA EROSION AND WATERSHED MANAGEMENT PROJECT (NEWMAP)
KATSINA STORMWATER DRAINAGE REHABILITATION PROJECT
(FUNTUA, MALUMFASHI, KATSINA AND JIBIA SITES)
STAKEHOLDERS' CONSULTATION FORUM HELD AT
STATE SECRETARIAT CHAMBER, KATSINA ON THURSDAY AUGUST 7, 2019**

ATTENDANCE REGISTRATION SHEET

S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
1	Adami Mohammed S	M	NEKREA	07036874021	
2	Nasiru Umar	M	Sociologist OIG	08038935010	
3	ABUBAKAR MAUMARI GEGE	M	MIN. OF ENVIRONMENT, K	0803 593 0077	
4	Yahaya Sami	M	Min. of Environment	08035926706	
5	Jafarun Labaran Daws	M	Min of Water Resour	08060763518	
6	Engr. Ismaili Muhammad	M	Min of Environment	07037384950	
7	Baro. Afiru Sami	M	Min. of J	08055947345	
8	Bukari Ahmed Bad	M	NEBWA	08030634954	
9	Halliru Mohammed	M	Presidents Ag PC	08028898984	
10	Abdullahi Jike Bano	M	Rep. Sent. Bar/Clay	07063262968	
11	Aisha Yusufu Sami	F	NEWMAP Katsina	08069098741	
12	Muhammad Usman Sulaiman	F	NEWMAP Katsina	08035678694	
13	Kabir Mohammed Sani	M	NEWMAP Katsina	05066175168	
14	Engr. Aisa Junaidu	M	M. O. W. KATSINA	0806221925	
15	Sani Sa'adu	M	KATSINA NEWMAP	08035879570	
16	Abdullahi Abdullahi	M	Nigeria Forest Dept	08024508753	
17	UBALE ABDURRAHMAN	M	MIN. OF WATER RESOURCES	08033850645	

S/No	NAME	GENDER	COMMUNITY/VILLAGE/ ORGANIZATION	PHONE NUMBER	SIGNATURE
18	Abdulaziz Salisu	M	KTTV Katsina	08036759314	
19	UMAR AHMED	V	KTTV	08059650443	
20	Bukari Ahmed Bani	M	STATE RADIO KEN	08030654954	
21	Sani Sami F.	V	NEWMAP	08036020625	
22	Dr. Yahaya Sani	M	Umaru Musa Yusufu University	0803217251	
23	Umar Danlami Danlami	M	KT SFNGO (ASCI)	08053305562	
24	Yusuf Umar	M	FMBN. Ks. (Controller)	08034839335	
25	Hajira Talatu Nasir	F	Min of Information KT	08034645397	
26	Dr. Ahmad Wali	M	Mpishi LGC	08063244744	
27	Muhammad Ritau	M	S'office BTG	07060871141	
28	Engr. Abdulkarim Muhammad	M	F.O.E. Katsina	0706231719	
29	Engr. Kabir Idris	M	Rep. P.S. MOW/KS	08061146356	
30	Haji Salisu Usman	M	Meamba Head Office	08131682277	
31	Muhammad Kabir	M	MO Environment Katsina	08037616374	
32	Mustafa Lawa	M	"	08034240357	
33	IRU ALI	M	SEPA	08035944498	
34	Yusuf Gamba K/Soro	M	REP. SEN. KAT CENTRAL	08034704209	
35	MURTA MUHAMMAD	M	KATSINA	08033912328	
36	MUHAMMAD MUHAMMAD	M	KATSINA		
37	Dr. Haruna D. M.	M	MOANA	08032433581	
38	Rafiq Sabir Ahmad	M	Ministry of Inform.	08166422277	
39	Abd. Isah Muhammad	M	Stormwater Council	08065408484	

Photos of FMKJ Projects Stakeholders' Meeting

STAKEHOLDERS' CONSULTATIVE FORUM





ANNEXURE VII: Mapping of Sampling Locations & Coordinates Across the FMKJ Sites

SAMPLING LOCATIONS AND COORDINATES ACROSS THE MALUMFASHI PROJECT SITES				
MALUMFASHI PROJECT SITE				
SAMPLE MEDIA	SAMPLING MODE	SAMPLE LOCATION	CODE	COORDINATES
SURFACE WATER SAMPLE	TARGETED	MALUMFASHI BYPASS	MLF/SWR/01	N 11°47'10.4" E 007° 38'08.9
	TARGETED	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	MLF /SWR/02	N 11° 46'27.8" E 007° 37'20'.3
	TARGETED	FAIMASA BRIDGE	MLF /SWR/03	N 11° 47'09.3" E 007° 36'57.2
	RANDOM	RAFIN DINYA	MLF /SWR/04	N 11° 47'16.9' E 007° 36'49.2
SOIL SAMPLE	TARGETED	DANRIMI AREA BY BYPASS	MLF /SS/01	N 11° 47'10.4" E 007° 38'08.9
	TARGETED	MALUMFASHI BYPASS	MLF /SS/02	N 11° 46'27.5" E 007° 37'20.3
	TARGETED	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	MLF /SS/03	N 11° 47'0.93" E 007° 36'57.2
	RANDOM	FAIMASA BRIDGE	MLF /SS/04	N 11° 47'17.5" E007° 37'02.6
	RANDOM	RAFIN DINYA	MLF /SS/05	N 11° 47'16.9' E 007° 36'49.2
AIR QUALITY	TARGETED	DANRIMI AREA BY BYPASS	MLF /AS/01	N 11° 47'10.4" E 007° 38'08.9
	TARGETED	MALUMFASHI BYPASS	MLF /AS/02	N 11° 46'27.8" E 007° 37'00.3
	TARGETED	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	MLF /AS/03	N 11° 47'09.3" E 007° 36'57.2
	RANDOM	FAIMASA BRIDGE	MLF /AS/04	N 11° 47'17.5" E 007° 37'02.6
	RANDOM	RAFIN DINYA	MLF /AS/05	N 11° 47'16.9' E 007° 36'49.2
GROUND WATER	TARGETED	DANRIMI AREA BY BYPASS	MLF /GWS/01	N 11° 47'17.5" E 007° 37'02.6

ANNEXURE VIII: Study Sampling Methods and Locations

Representative soil samples for laboratory analysis were both randomly and targetedly collected from areas that show adverse environmental conditions within each of the FMKJ sites. Total of five soil samples were collected from each of the Malumfashi drainage corridor and. Each near surface soil sample (0 - 6 inches depth) was collected using the Dutch hand auger and put in a properly labeled self-sealing plastic bag for shipment to the MGG Resources laboratory at Nsukka for chemical analysis. The matrix of soil sampling locations and coordinates across the Malumfashi site are included in Annex X.

Soil parameters indicate the state of soil ecosystem characteristics, which especially reflect productive, buffering, filtering and other soil functions. The structure of soil profile (the soil class), soil type, soil depth, the chemical content and quality of humus substances, accessible nutrient supply, soil reaction, the content of foreign substances in soil, and soil edaphon is of highest importance. Soil quality is significantly affected by physical, chemical, biological and biochemical properties sensitive to changes in the environment and land management. With regard to physical properties, there are bulk density, porosity, water retention capacity, soil temperature, etc. In the group of chemical characteristics, total carbon and nitrogen content, soil reaction and content of available nutrients are observed.

Evaluation of biological parameters focuses on microbial biomass and its activity, soil respiration, potentially mineralised nitrogen, the activity of soil enzymes, etc. Soil enzymatic activity can be used as a microbial indicator of soil quality, since the activity of soil enzymes is closely related to essential soil characteristics. It indicates changes sooner than other soil characteristics and can be an integrating soil-biological index reflecting soil use. Selected enzymatic activities can be suitable indicators for long-term soil monitoring and quality assessment of soils.

A decrease in soil quality results from the load of risk substances such as heavy metals in the soil. Heavy metals as a large group of pollutants are a serious problem in all components of the environment, including soil. A great number of these metals have considerable toxic effects and their highest allowable concentrations are defined for the soil system, similarly to those for air and water. However, it has been extremely difficult to define limit concentrations of heavy metals for soil, since, in contrast to air and water, soil is an extremely heterogeneous system and mobility of inorganic contaminants, closely related to the intake by plants, depends on several soil factors. The approaches towards the determination of metal concentration limits in soil vary significantly in individual countries. In some countries, the definition of limits for heavy metals concentrations is based on soil use (these are defined as so-called trigger and action values), or, possibly, on eco-toxicological data in so-called standard soil and limit values for the total and dissolvable concentration of heavy metals in soil (Barančíková, 1998; Makovniková et al., 2006).

Soil may be considered a passive acceptor of heavy metals that becomes the source of polluting other components of the environment and the food chain. The analytical results of the baseline soil quality indicators within and around the project corridor show concentrations below the regulatory threshold limits as summarized in the Table 3.4. These results do not show concentrations that will pose any potential health risks to residents and project construction workers during the construction phase of the project. The complete analytical results are included in Annex XIV - XVII.

ANNEXURE IX: Baseline Noise Readings and Sampling Locations

Malumfashi Project Site Noise Readings

S/N	NOISE READING LOCATIONS	MINIMUM (dB)	MAXIMUM (dB)	COORDINATES
1.	DANRIMI BYPASS	49.2	70.6	N11 ⁰ 47.610; E007 ⁰ 18.989
2.	MALUFANSHI BYPASS BESIDE GGGS	54.2	87.5	N11 ⁰ 31.186; E007 ⁰ 19.012
3.	UNGUWAR SODANJI BESIDE LOLO DAKARE FUEL STATION	62.1	76.8	N11 ⁰ 33.319; E007 ⁰ 18.667
4.	FAIMASA BRIDGE	56.7	82.1	N11 ⁰ 33.169; E007 ⁰ 17.257
5.	RAFIN DINYA	55.0	85.9	N11 ⁰ 47.283; E007 ⁰ 36.317

ANNEXURE X: Complete Plant Listing from Vegetative Study

Table 3.5: Listing of Prominent and Indicator Plant Species Found at The Project Area Showing Life Forms, Families and Distribution of Species

S/N	Species	Family	Life Form	Common Name	Local Name
1	<i>Lannea schimperi</i>	Anacardaceae	Shrub/Tree	Lannea	Faru
2	<i>Adenium obesum</i>	Apocynaceae	Shrub	Desert rose	Gariya
3	<i>Borassus aethiopicum</i>	Arecaceae	Tree	Fan palm	Giginya
4	<i>Hyphaene thebaica</i>	Arecaceae	Tree	Dum palm	Goruba
5	<i>Calotropis procera</i>	Asclepiadaceae	Tree	Swallow swort,	Tumfafiya
6	<i>Leptadenia hastata</i>	Asclepiadaceae	Herb	Leptadenia	Dan barawo
7	<i>Asparagus Africana</i>	Asparagaceae	Herb	Asparagus	Sarka
8	<i>Aspilia Africana</i>	Asteraceae	Herb	Haemorrhage plant	Yunyun
9	<i>Adansonia digitata</i>	Bombacaea	Tree	Baobab	Kukka
10	<i>Cadaba farinose</i>	Capparidaceae	Shrub	Cadaba	Hanza
11	<i>Anogeissus leiocarpus</i>	Combretaceae	Tree	Axle wood	Marke
12	<i>Combretum micranthum</i>	Combretaceae	Shrub	Combretum	Geza
13	<i>Combretum nigricans</i>	Combretaceae	Shrub	Combretum	Tsiriri
14	<i>Gueira senegalensis</i>	Combretaceae	Shrub/Tree	Moshi medicine	Sabara
15	<i>Ipomea asarifolia</i>	Convolvulaceae	Herb	Morning glory	Duman kadda
16	<i>Diospyros mespiliformis</i>	Ebenaceae	Tree	Ebony tree	Kaiwa
17	<i>Acacia macrostachya</i>	Fabaceae	Tree	Acacia	Gardaye
18	<i>Acacia nilotica</i>	Fabaceae	Tree	Acacia	Bagaruwa
19	<i>Acacia senegalensis</i>	Fabaceae	Tree	Acacia	Farar Kaya
20	<i>Bauhinia rufescens</i>	Fabaceae	Shrub	Bauhinia	Jirga
21	<i>Cassia fistula</i>	Fabaceae	Tree	Golden shower	Malga
22	<i>Cassia singueana</i>	Fabaceae	Tree	Winter cassia	Runfu
23	<i>Dichrostachys cinerea</i>	Fabaceae	Shrub	West African sickle	Dundu
24	<i>Mimosa pigra</i>	Fabaceae	Herb	Sensitive plant/ touch & die	Gumbi
25	<i>Piliostigma thonningii</i>	Fabaceae	Tree	Camel's foot	Kalgo
26	<i>Tamarindus indica</i>	Fabaceae	Tree	Tamarin tree	Tsamiya
27	<i>Azadirachta indica</i>	Meliaceae	Tree	Neem	Dogon yaro
28	<i>Moringa oleifera</i>	Moringaceae	Tree	Medicine tree	Zogole
29	<i>Psidium guajava</i>	Myrtaceae	Tree	Guava	Gwava
30	<i>Rogeria adenophylla</i>	Pedaliaceae	Herb	Tanum tree	Loda
31	<i>Ziziphus mauritiana</i>	Rhamnaceae	Shrub	Jujub tree	Magarya
32	<i>Feretia apodanthera</i>	Rubiaceae	Shrub	Feretia	Kurukuru
33	<i>Balanites aegyptiaca</i>	Zygophyllaceae	Tree	Desert date	Aduwa

Source: Field Survey; July, 2019.

ANNEXURE XI: Laboratory Analytical Results (Malumfashi Project Site)

MGG RESOURCES LTD (More Gain in God)

Public Analysis, Industrial/Environmental Consultants,
Water Treatment Specialist

RC: 768166, FMENV ACCREDITATION NO. 002637, NESREA ACCREDITATION NO 423

21 University Road, Nsukka, Enugu State.

18th August, 2019.

Dear sir,

MLF (WATER (WS), SOIL (SS) AND AIR (AS)) SAMPLES ANALYSES RESULTS

Please find attached the result of the analyses of the samples brought to our laboratory on the 7th August, 2019.

Thanks for your patronage.

Yours faithfully,

Alum O. L (Mrs.)

MLF/SWR/1/ N 11°47'10.4" E 7°38'08.9" E622m

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	WHO	METHOD	REMARK
1	Temperature	0 C	20.80	40	32-34	In-situ	Satisfactory
2	pH	-	7.60	6.5 - 8.0	6.5-8.5	In-situ	Satisfactory
3	Taste	-	Has taste	NS	Nil	Organoleptic	Unsatisfactory
4	Appearance	-	Turbid	NS	Nil	Organoleptic	Unsatisfactory
5	Odour	-	Has odour	NS	Nil	Organoleptic	Unsatisfactory
6	Total Dissolved Solids	mg/L	53.00		500	ASTM, 2005.	Satisfactory
7	Conductivity	µS/Cm	116.60	1000 µS/Cm	1500	In-situ	Satisfactory
8	Total hardness	mg/L	44.00	NS	120-180	ASTM, 2005.	Satisfactory
9	Chloride	mg/L	21.30	NS	250	ASTM, 2005.	Satisfactory
10	Fluoride	mg/L	2.12	NS	2.0	ASTM, 2005.	Unsatisfactory
11	Sodium	mg/L	4.46	10	20	ASTM, 2005.	Satisfactory
12	Potassium	mg/L	14.23	NS	NS	ASTM, 2005.	Satisfactory
13	Sulphate	mg/L	30.11	250	250	ASTM, 2005.	Satisfactory
14	Sulphide	mg/L	0.19	NS	0.2	ASTM, 2005.	Satisfactory
15	Ammonia	mg/L	2.13	NS	1.5	ASTM, 2005.	Unsatisfactory
16	Nitrate	mg/L	52.00	50	10	ASTM, 2005.	Unsatisfactory
17	Phosphate	mg/L	6.22	5	5	ASTM, 2005.	Unsatisfactory
18	DO	mg/L	5.22	6	6	ASTM, 2005.	Unsatisfactory
19	BOD	mg/L	27.20	6	6	ASTM, 2005.	Unsatisfactory
20	COD	mg/L	90.40	30	NS	ASTM, 2005.	Unsatisfactory
21	Chromium	mg/L	1.00	0.1	0.03	AAS	Unsatisfactory
22	Copper	mg/L	Bdl	3	2	AAS	Satisfactory
23	Iron	mg/L	3.18	1	0.3	AAS	Unsatisfactory
24	Zinc	mg/L	0.06	< 1	0.01	AAS	Unsatisfactory
25	Lead	mg/L	Bdl	0.1	0.01	AAS	Satisfactory
26	Nickel	mg/L	0.31	0.1	0.2	AAS	Unsatisfactory
27	Manganese	mg/L	0.06	0.01	0.02	AAS	Unsatisfactory
28	Silver (Ag+)	mg/L	0.09	< 1	0.10	AAS	Satisfactory
29	Calcium	mg/L	96.00	NS	NS	ASTM, 2005.	Satisfactory
30	Magnesium	mg/L	24.00	NS	NS	ASTM, 2005.	Satisfactory
31	Total Alkalinity	mg/L	224.00	NS	NS	ASTM, 2005.	Satisfactory
32	Hydroxide	mg/L	Nil	NS	NS	ASTM, 2005.	Satisfactory
33	Bicarbonate	mg/L	52.00	NS	NS	ASTM, 2005.	Satisfactory
	Microbial Analysis						
34	E-Coli	cfu/mL	3.0 x 10 ¹	0	0	ASTM, 2005.	Unsatisfactory
35	Total Coliform	cfu/mL	4.0 x10 ²	0	0	ASTM, 2005.	Unsatisfactory
36	Total viable counts	cfu/mL	2.6 x 10 ⁵	NS	NS	ASTM, 2005.	Unsatisfactory

µS/Cm = Micro Siemens per centimeter

NS = Not Specified

mg/L = milligram per litre

cfu = Coliform forming units.

MLF /SWR/2/ N 11° 46'27.8" E 7° 37' 20.3" E 618 m.

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	WHO LIMITS	METHOD	REMARK
1	Temperature	° C	20.70	40	32-34	In-situ	Satisfactory
2	pH	-	8.00	6.5 - 8.0	6.5-8.5	In-situ	Satisfactory
3	Taste	-	Slight taste	NS	Nil	Organoleptic	Unsatisfactory
4	Appearance	-	Turbid	NS	Nil	Organoleptic	Unsatisfactory
5	Odour	-	Has odour	NS	Nil	Organoleptic	Unsatisfactory
6	Total Dissolved Solids	mg/L	61.00	2100	500	ASTM, 2005.	Satisfactory
7	Conductivity	µS/Cm	134.20	1000 µS/Cm	1500	In-situ	Satisfactory
8	Total hardness	mg/L	120.00	NS	120-180	ASTM, 2005.	Satisfactory
9	Chloride	mg/L	24.14	NS	250	ASTM, 2005.	Satisfactory
10	Fluoride	mg/L	0.14	NS	2.0	ASTM, 2005.	Satisfactory
11	Sodium	mg/L	6.27	10	20	ASTM, 2005.	Satisfactory
12	Potassium	mg/L	17.56	NS	NS	ASTM, 2005.	Satisfactory
13	Sulphate	mg/L	41.13	250	250	ASTM, 2005.	Satisfactory
14	Sulphide	mg/L	0.21	NS	0.2	ASTM, 2005.	Unsatisfactory
15	Ammonia	mg/L	0.13	NS	1.5	ASTM, 2005.	Satisfactory
16	Nitrate	mg/L	62.00	50	10	ASTM, 2005.	Unsatisfactory
17	Phosphate	mg/L	6.43	5	5	ASTM, 2005.	Unsatisfactory
18	DO	mg/L	5.20	6	6	ASTM, 2005.	Unsatisfactory
19	BOD	mg/L	11.2	6	6	ASTM, 2005.	Unsatisfactory
20	COD	mg/L	37.6	30	NS	ASTM, 2005.	Unsatisfactory
21	Chromium	mg/L	0.18	0.1	0.03	AAS	Unsatisfactory
22	Copper	mg/L	Bdl	3	2	AAS	Satisfactory
23	Iron	mg/L	9.53	1	0.3	AAS	Unsatisfactory
24	Zinc	mg/L	0.09	< 1	0.01	AAS	Unsatisfactory
25	Lead	mg/L	Bdl	0.1	0.01	AAS	Satisfactory
26	Nickel	mg/L	0.41	0.1	0.2	AAS	Unsatisfactory
27	Manganese	mg/L	0.16	0.01	0.02	AAS	Unsatisfactory
28	Silver (Ag ⁺)	mg/L	Bdl	< 1	0.10	AAS	Satisfactory
29	Calcium	mg/L	96.00	NS	NS	ASTM, 2005.	Satisfactory
30	Magnesium	mg/L	24.00	NS	NS	ASTM, 2005.	Satisfactory
31	Total Alkalinity	mg/L	176.00	NS	NS	ASTM, 2005.	Satisfactory
32	Hydroxide	mg/L	Nil	NS	NS	ASTM, 2005.	Satisfactory
33	Bicarbonate	mg/L	56.20	NS	NS	ASTM, 2005.	Satisfactory
	Microbial Analysis						
34	E-Coli	cfu/mL	1.0 x 10	0	0	ASTM, 2005.	Unsatisfactory
35	Total Coliform	cfu/mL	8.0 x 10 ¹	0	0	ASTM, 2005.	Unsatisfactory
36	Total viable counts	cfu/mL	1.6 x 10 ⁵	NS	NS	ASTM, 2005.	Unsatisfactory

MLF /SWR/3/ N 11° 47'09.3" E 7° 36'57.2" E 613 m.

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	WHO LIMITS	METHOD	REMARK
1	Temperature	° C	20.80	40	32-34	In-situ	Satisfactory
2	pH	-	7.4	6.5 - 8.0	6.5-8.5	In-situ	Satisfactory
3	Taste	-	Has taste	NS	Nil	Organoleptic	Unsatisfactory
4	Appearance	-	Turbid	NS	Nil	Organoleptic	Unsatisfactory
5	Odour	-	Has odour	NS	Nil	Organoleptic	Unsatisfactory
6	Total Dissolved Solids	mg/L	318.00	2100	500	ASTM, 2005.	Satisfactory
7	Conductivity	µS/Cm	699.60	1000 µS/Cm	1500	In-situ	Satisfactory
8	Total hardness	mg/L	160.00	NS	120-180	ASTM, 2005.	Satisfactory
9	Chloride	mg/L	123.54	NS	250	ASTM, 2005.	Satisfactory
10	Fluoride	mg/L	0.14	NS	2.0	ASTM, 2005.	Satisfactory
11	Sodium	mg/L	7.15	10	20	ASTM, 2005.	Satisfactory
12	Potassium	mg/L	2.01	NS	NS	ASTM, 2005.	Satisfactory
13	Sulphate	mg/L	86.96	250	250	ASTM, 2005.	Satisfactory
14	Sulphide	mg/L	4.21	NS	0.2	ASTM, 2005.	Unsatisfactory
15	Ammonia	mg/L	2.16	NS	1.5	ASTM, 2005.	Unsatisfactory
16	Nitrate	mg/L	51.30	50	10	ASTM, 2005.	Unsatisfactory
17	Phosphate	mg/L	6.55	5	5	ASTM, 2005.	Unsatisfactory
18	DO	mg/L	4.40	6	6	ASTM, 2005.	Unsatisfactory
19	BOD	mg/L	22.40	6	6	ASTM, 2005.	Unsatisfactory
20	COD	mg/L	72.8	30	NS	ASTM, 2005.	Unsatisfactory
21	Chromium	mg/L	Bdl	0.1	0.03	AAS	Satisfactory
22	Copper	mg/L	0.01	3	2	AAS	Satisfactory
23	Iron	mg/L	0.49	1	0.3	AAS	Unsatisfactory
24	Zinc	mg/L	0.03	< 1	0.01	AAS	Unsatisfactory
25	Lead	mg/L	Bdl	0.1	0.01	AAS	Satisfactory
26	Nickel	mg/L	0.21	0.1	0.2	AAS	Unsatisfactory
27	Manganese	mg/L	0.13	0.01	0.02	AAS	Unsatisfactory
28	Silver (Ag ⁺)	mg/L	0.06	< 1	0.10	AAS	Satisfactory
29	Calcium	mg/L	102.00	NS	NS	ASTM, 2005.	Satisfactory
30	Magnesium	mg/L	58.00	NS	NS	ASTM, 2005.	Satisfactory
31	Total Alkalinity	mg/L	504.00	NS	NS	ASTM, 2005.	Satisfactory
32	Hydroxide	mg/L	Nil	NS	NS	ASTM, 2005.	Satisfactory
33	Bicarbonate	mg/L	22.00	NS	NS	ASTM, 2005.	Satisfactory
Microbial Analysis							
34	E-Coli	cfu/mL	5.0 x 10	0	0	ASTM, 2005.	Unsatisfactory
35	Total Coliform	cfu/mL	1.2 x 10 ²	0	0	ASTM, 2005.	Unsatisfactory
36	Total viable counts	cfu/mL	1.8 x 10 ⁵	NS	NS	ASTM, 2005.	Unsatisfactory

MLF /SWR/4/ N 11° 47'16.9" E 7° 36'49.2" E 596 m.

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	WHO LIMITS	METHOD	REMARK
1	Temperature	° C	20.80	40	32-34	In-situ	Satisfactory
2	pH	-	7.4	6.5 - 8.0	6.5-8.5	In-situ	Satisfactory
3	Taste	-	Slight taste	NS	Nil	Organoleptic	Unsatisfactory
4	Appearance	-	Turbid	NS	Nil	Organoleptic	Unsatisfactory
5	Odour	-	Has odour	NS	Nil	Organoleptic	Unsatisfactory
6	Total Dissolved Solids	mg/L	366.00	2100	500	ASTM, 2005.	Satisfactory
7	Conductivity	µS/Cm	805.20	1000 µS/Cm	1500	In-situ	Satisfactory
8	Total hardness	mg/L	40.00	NS	120-180	ASTM, 2005.	Satisfactory
9	Chloride	mg/L	139.16	NS	250	ASTM, 2005.	Satisfactory
10	Fluoride	mg/L	0.15	NS	2.0	ASTM, 2005.	Satisfactory
11	Sodium	mg/L	7.41	10	20	ASTM, 2005.	Satisfactory
12	Potassium	mg/L	1.93	NS	NS	ASTM, 2005.	Satisfactory
13	Sulphate	mg/L	67.26	250	250	ASTM, 2005.	Satisfactory
14	Sulphide	mg/L	0.22	NS	0.2	ASTM, 2005.	Unsatisfactory
15	Ammonia	mg/L	0.13	NS	1.5	ASTM, 2005.	Satisfactory
16	Nitrate	mg/L	68.00	50	10	ASTM, 2005.	Unsatisfactory
17	Phosphate	mg/L	5.28	5	5	ASTM, 2005.	Unsatisfactory
18	DO	mg/L	3.28	6	6	ASTM, 2005.	Unsatisfactory
19	BOD	mg/L	19.20	6	6	ASTM, 2005.	Unsatisfactory
20	COD	mg/L	64.00	30	NS	ASTM, 2005.	Unsatisfactory
21	Chromium	mg/L	0.06	0.1	0.03	AAS	Unsatisfactory
22	Copper	mg/L	0.02	3	2	AAS	Satisfactory
23	Iron	mg/L	0.73	1	0.3	AAS	Unsatisfactory
24	Zinc	mg/L	0.06	< 1	0.01	AAS	Unsatisfactory
25	Lead	mg/L	0.25	0.1	0.01	AAS	Unsatisfactory
26	Nickel	mg/L	0.62	0.1	0.2	AAS	Unsatisfactory
27	Manganese	mg/L	0.06	0.01	0.02	AAS	Unsatisfactory
28	Silver (Ag ⁺)	mg/L	0.11	< 1	0.10	AAS	Unsatisfactory
29	Calcium	mg/L	28.00	NS	NS	ASTM, 2005.	Satisfactory
30	Magnesium	mg/L	12.00	NS	NS	ASTM, 2005.	Satisfactory
31	Total Alkalinity	mg/L	528.00	NS	NS	ASTM, 2005.	Satisfactory
32	Hydroxide	mg/L	Nil	NS	NS	ASTM, 2005.	Satisfactory
33	Bicarbonate	mg/L	16.20	NS	NS	ASTM, 2005.	Satisfactory
	Microbial Analysis						
34	E-Coli	cfu/mL	1.0 x 10	0	0	ASTM, 2005.	Unsatisfactory
35	Total Coliform	cfu/mL	9.0 x 10 ²	0	0	ASTM, 2005.	Unsatisfactory
36	Total viable counts	cfu/mL	1.7 x 10 ⁵	NS	NS	ASTM, 2005.	Unsatisfactory

MLF /GWS/1/ N 11° 47'17.5" E 7° 37'02.6" E 607 m

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	WHO LIMITS	METHOD	REMARK
1	Temperature	0 C	20.80	40	32-34	In-situ	Satisfactory
2	pH	-	7.3	6.5 - 8.0	6.5-8.5	In-situ	Satisfactory
3	Taste	-	Has taste	NS	Nil	Organoleptic	Unsatisfactory
4	Appearance	-	Turbid	NS	Nil	Organoleptic	Unsatisfactory
5	Odour	-	Has odour	NS	Nil	Organoleptic	Unsatisfactory
6	Total Dissolved Solids	mg/L	85.00	2100	500	ASTM, 2005.	Satisfactory
7	Conductivity	µS/Cm	187.00	1000 µS/Cm	1500	In-situ	Satisfactory
8	Total hardness	mg/L	56.00	NS	120-180	ASTM, 2005.	Satisfactory
9	Chloride	mg/L	123.54	NS	250	ASTM, 2005.	Satisfactory
10	Fluoride	mg/L	Nil	NS	2.0	ASTM, 2005.	Satisfactory
11	Sodium	mg/L	5.26	10	20	ASTM, 2005.	Satisfactory
12	Potassium	mg/L	16.39	NS	NS	ASTM, 2005.	Satisfactory
13	Sulphate	mg/L	41.13	250	250	ASTM, 2005.	Satisfactory
14	Sulphide	mg/L	0.10	NS	0.2	ASTM, 2005.	Satisfactory
15	Ammonia	mg/L	0.01	NS	1.5	ASTM, 2005.	Satisfactory
16	Nitrate	mg/L	8.52	50	10	ASTM, 2005.	Satisfactory
17	Phosphate	mg/L	0.05	5	5	ASTM, 2005.	Satisfactory
18	DO	mg/L	6.10	6	6	ASTM, 2005.	Satisfactory
19	BOD	mg/L	8.00	6	6	ASTM, 2005.	Unsatisfactory
20	COD	mg/L	26.4	30	NS	ASTM, 2005.	Satisfactory
21	Chromium	mg/L	0.06	0.1	0.03	AAS	Unsatisfactory
22	Copper	mg/L	Bdl	3	2	AAS	Satisfactory
23	Iron	mg/L	0.24	1	0.3	AAS	Satisfactory
24	Zinc	mg/L	0.06	< 1	0.01	AAS	Unsatisfactory
25	Lead	mg/L	Bdl	0.1	0.01	AAS	Satisfactory
26	Nickel	mg/L	0.72	0.1	0.2	AAS	Unsatisfactory
27	Manganese	mg/L	0.06	0.01	0.02	AAS	Unsatisfactory
28	Silver (Ag+)	mg/L	0.06	< 1	0.10	AAS	Satisfactory
29	Calcium	mg/L	39.00	NS	NS	ASTM, 2005.	Satisfactory
30	Magnesium	mg/L	17.00	NS	NS	ASTM, 2005.	Satisfactory
31	Total Alkalinity	mg/L	56.00	NS	NS	ASTM, 2005.	Satisfactory
32	Hydroxide	mg/L	Nil	NS	NS	ASTM, 2005.	Satisfactory
33	Bicarbonate	mg/L	22.40	NS	NS	ASTM, 2005.	Satisfactory
Microbial Analysis							
34	E-Coli	cfu/MI	0	0	0	ASTM, 2005.	Satisfactory
35	Total Coliform	cfu/MI	1.0 x 10 ⁰	0	0	ASTM, 2005.	Unsatisfactory
36	Total viable counts	cfu/MI	2.4 x 10 ²	NS	NS	ASTM, 2005.	Unsatisfactory

MLF /SS/1/ N 11°47'10.4" E 7°38'08.9" E622 m

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	METHOD	REMARK
1	pH (KCl)	-	6.50	-	pH meter	Satisfactory
2	pH (10% solution @ 25oC	-	7.80	6.5-9.0	pH meter	Satisfactory
3	Nitrate	mg/kg	2.30	-	ASTM, 2005.	Satisfactory
4	Moisture	%	15.07	-	ASTM, 2005.	Satisfactory
5	Electrical conductivity	µS/Cm	140.80	-	Conductivity meter	Satisfactory
6	Soil colour	-	Yellowish	-	Visual Inspection	Satisfactory
7	Potassium (K+)	mg/kg	0.05	-	ASTM, 2005.	Satisfactory
8	Magnesium (Mg2+)	mg/kg	0.40	-	ASTM, 2005.	Satisfactory
9	Calcium (Ca2+)	mg/kg	2.20	-	ASTM, 2005.	Satisfactory
10	Sodium (Na+)	mg/kg	0.02	-	ASTM, 2005.	Satisfactory
11	Available Phosphorus	mg/kg	0.93	5	ASTM, 2005.	Unsatisfactory
12	Organic Matter	%	0.46	-	ASTM, 2005.	Satisfactory
13	Nitrogen	%	0.07	-	ASTM, 2005.	Satisfactory
14	Organic Carbon	%	0.27	-	ASTM, 2005.	Satisfactory
15	Iron (Fe2+)	mg/kg	5.20	0.03	AAS	Satisfactory
16	Lead (Pb2+)	mg/kg	1.00	164	AAS	Satisfactory
17	Copper (Cu2+)	mg/kg	Bdl	100	AAS	Satisfactory
18	Zinc (Zn2+)	mg/kg	0.08	-	AAS	Satisfactory
19	Grain Size Distribution (Coarse Sand)	%	10.00	-	ASTM, 2005.	Satisfactory
20	Grain Size Distribution (Clay)	%	8.00	-	ASTM, 2005.	Satisfactory
21	Grain Size Distribution (Silt)	%	14.00	-	ASTM, 2005.	Satisfactory
22	Grain Size Distribution (Fine Sand)	%	68.00	-	ASTM, 2005.	Satisfactory
23	Textural Class	-	Sandy loamy	-	ASTM, 2005	Satisfactory

MLF /SS/2/ N 11°46'27.5" E 7°37'20.3" E618 m

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	METHOD	REMARK
1	pH (KCl)	-	7.50	-	pH meter	Satisfactory
2	pH (10% solution @ 25oC	-	8.30	6.5-9.0	pH meter	Satisfactory
3	Nitrate	mg/kg	3.20	-	ASTM, 2005.	Satisfactory
4	Moisture	%	9.99	-	ASTM, 2005.	Satisfactory
5	Electrical conductivity	µS/Cm	191.40	-	Conductivity meter	Satisfactory
6	Soil colour	-	Brownish	-	Visual Inspection	Satisfactory
7	Potassium (K+)	mg/kg	0.05	-	ASTM, 2005.	Satisfactory
8	Magnesium (Mg2+)	mg/kg	0.20	-	ASTM, 2005.	Satisfactory
9	Calcium (Ca2+)	mg/kg	3.60	-	ASTM, 2005.	Satisfactory
10	Sodium (Na+)	mg/kg	0.02	-	ASTM, 2005.	Satisfactory
11	Available Phosphorus	mg/kg	0.87	5	ASTM, 2005.	Unsatisfactory
12	Organic Matter	%	0.77	-	ASTM, 2005.	Satisfactory
13	Nitrogen	%	0.06	-	ASTM, 2005.	Satisfactory
14	Organic Carbon	%	0.45	-	ASTM, 2005.	Satisfactory
15	Iron (Fe2+)	mg/kg	1.25	0.03	AAS	Unsatisfactory
16	Lead (Pb2+)	mg/kg	0.25	164	AAS	Satisfactory
17	Copper (Cu2+)	mg/kg	0.13	100	AAS	Satisfactory
18	Zinc (Zn2+)	mg/kg	0.08	-	AAS	Satisfactory
19	Grain Size Distribution (Coarse Sand)	%	30.00	-	ASTM, 2005.	Satisfactory
20	Grain Size Distribution (Clay)	%	8.00	-	ASTM, 2005.	Satisfactory
21	Grain Size Distribution (Silt)	%	14.00	-	ASTM, 2005.	Satisfactory
22	Grain Size Distribution (Fine Sand)	%	48.00	-	ASTM, 2005.	Satisfactory
23	Textural Class	-	Sandy loamy	-	ASTM, 2005.	Satisfactory

MLF /SS/3/ N 11°47'0.93" E 7°36'57.2" E613 m

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	METHOD	REMARK
1	pH (KCl)	-	8.80	-	pH meter	Satisfactory
2	pH (10% solution @ 25oC	-	9.70	6.5-9.0	pH meter	Satisfactory
3	Nitrate	mg/kg	2.40	-	ASTM, 2005.	Satisfactory
4	Moisture	%	19.62	-	ASTM, 2005.	Satisfactory
5	Electrical conductivity	µS/Cm	646.80	-	Conductivity meter	Satisfactory
6	Soil colour	-	Brownish	-	Visual Inspection	Satisfactory
7	Potassium (K+)	mg/kg	0.05	-	ASTM, 2005.	Satisfactory
8	Magnesium (Mg2+)	mg/kg	1.20	-	ASTM, 2005.	Satisfactory
9	Calcium (Ca2+)	mg/kg	5.00	-	ASTM, 2005.	Satisfactory
10	Sodium (Na+)	mg/kg	0.02	-	ASTM, 2005.	Satisfactory
11	Available Phosphorus	mg/kg	12.12	5	ASTM, 2005.	Satisfactory
12	Organic Matter	%	0.39	-	ASTM, 2005.	Satisfactory
13	Nitrogen	%	0.04	-	ASTM, 2005.	Satisfactory
14	Organic Carbon	%	0.22	-	ASTM, 2005.	Satisfactory
15	Iron (Fe2+)	mg/kg	5.20	0.03	AAS	Unsatisfactory
16	Lead (Pb2+)	mg/kg	Bdl	164	AAS	Satisfactory
17	Copper (Cu2+)	mg/kg	0.19	100	AAS	Satisfactory
18	Zinc (Zn2+)	mg/kg	0.85	-	AAS	Satisfactory
19	Grain Size Distribution (Coarse Sand)	%	33.00	-	ASTM, 2005.	Satisfactory
20	Grain Size Distribution (Clay)	%	8.00	-	ASTM, 2005.	Satisfactory
21	Grain Size Distribution (Silt)	%	14.00	-	ASTM, 2005.	Satisfactory
22	Grain Size Distribution (Fine Sand)	%	45.00	-	ASTM, 2005.	Satisfactory
23	Textural Class	-	Sandy loamy	-	ASTM, 2005.	Satisfactory

MLF /SS/4/ N 11° 47'17.5" E007° 37'02.6" E 607 m

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	METHOD	REMARK
1	pH (KCl)	-	6.90	-	pH meter	Satisfactory
2	pH (10% solution @ 25Oc	-	8.30	6.5-9.0	pH meter	Satisfactory
3	Nitrate	mg/kg	10.20	-	ASTM, 2005.	Satisfactory
4	Moisture	%	20.19	-	ASTM, 2005.	Satisfactory
5	Electrical conductivity	μS/C m	20.80	-	Conductivity meter	Satisfactory
6	Soil colour	-	Yellowish	-	Visual Inspection	Satisfactory
7	Potassium (K+)	mg/kg	0.04	-	ASTM, 2005.	Satisfactory
8	Magnesium (Mg2+)	mg/kg	1.60	-	ASTM, 2005.	Satisfactory
9	Calcium (Ca2+)	mg/kg	3.60	-	ASTM, 2005.	Satisfactory
10	Sodium (Na+)	mg/kg	0.02	-	ASTM, 2005.	Satisfactory
11	Available Phosphorus	mg/kg	18.65	5	ASTM, 2005.	Satisfactory
12	Organic Matter	%	0.19	-	ASTM, 2005.	Satisfactory
13	Nitrogen	%	0.06	-	ASTM, 2005.	Satisfactory
14	Organic Carbon	%	0.11	-	ASTM, 2005.	Satisfactory
15	Iron (Fe2+)	mg/kg	2.40	0.03	AAS	Unsatisfactory
16	Lead (Pb2+)	mg/kg	Bdl	164	AAS	Satisfactory
17	Copper (Cu2+)	mg/kg	0.07	100	AAS	Satisfactory
18	Zinc (Zn2+)	mg/kg	0.03	-	AAS	Satisfactory
19	Grain Size Distribution (Coarse Sand)	%	49.00	-	ASTM, 2005.	Satisfactory
20	Grain Size Distribution (Clay)	%	6.00	-	ASTM, 2005.	Satisfactory
21	Grain Size Distribution (Silt)	%	10.00	-	ASTM, 2005.	Satisfactory
22	Grain Size Distribution (Fine Sand)	%	35.00	-	ASTM, 2005.	Satisfactory
23	Textural Class	-	Loamy sandy	-	ASTM, 2005.	Satisfactory

MLF /SS/5/ N 11° 47'16.9' E 007° 36'49.2'' E 596 m.

S/N	PARAMETERS TESTED	UNITS	AVERAGE VALUE/ RESULTS	NESREA/ FMENV LIMITS	METHOD	REMARK
1	pH (KCl)	-	7.70	-	pH meter	Satisfactory
2	pH (10% solution @ 25oC	-	8.60	6.5-9.0	pH meter	Satisfactory
3	Nitrate	mg/kg	3.20	-	ASTM, 2005.	Satisfactory
4	Moisture	-	17.79	-	ASTM, 2005.	Satisfactory
5	Electrical conductivity	µS/Cm	147.40	-	Conductivity meter	Satisfactory
6	Soil colour	%	Brownish	-	Visual Inspection	Satisfactory
7	Potassium (K+)	mg/kg	0.04	-	ASTM, 2005.	Satisfactory
8	Magnesium (Mg2+)	mg/kg	1.00	-	ASTM, 2005.	Satisfactory
9	Calcium (Ca2+)	mg/kg	2.00	-	ASTM, 2005.	Satisfactory
10	Sodium (Na+)	mg/kg	0.02	-	ASTM, 2005.	Satisfactory
11	Available Phosphorus	mg/kg	0.93	5	ASTM, 2005.	Unsatisfactory
12	Organic Matter	%	0.31	-	ASTM, 2005.	Satisfactory
13	Nitrogen	%	0.04	-	ASTM, 2005.	Satisfactory
14	Organic Carbon	%	0.18	-	ASTM, 2005.	Satisfactory
15	Iron (Fe2+)	mg/kg	1.22	0.03	AAS	Unsatisfactory
16	Lead (Pb2+)	mg/kg	3.75	164	AAS	Satisfactory
17	Copper (Cu2+)	mg/kg	Bdl	100	AAS	Satisfactory
18	Zinc (Zn2+)	mg/kg	0.18	-	AAS	Satisfactory
19	Grain Size Distribution (Coarse Sand)	%	58.00	-	ASTM, 2005.	Satisfactory
20	Grain Size Distribution (Clay)	%	10.00	-	ASTM, 2005.	Satisfactory
21	Grain Size Distribution (Silt)	%	24.00	-	ASTM, 2005.	Satisfactory
22	Grain Size Distribution (Fine Sand)	%	8.00	-	ASTM, 2005.	Satisfactory
23	Textural Class	-	Sandy loamy	-	ASTM, 2005.	Satisfactory

MLF /AS/1/ N 11°47'10.4" E 7°38'08.9" E622m.

BDL = Below detectable limit.

MGA = M40 Gas Analyser

Ppm = Parts per million.

S/N	PARAMETERS TESTED	UNITS	NESREA	RESULT	METHOD	REMARK
1	Hydrogen Sulphide (H2S)	Ppm	5	0	M40 Gas Analyser (direct reading method) (MGA)	BDL
2	Carbon monoxide (CO)	Ppm	500	0		BDL
3	Nitric Oxide (NO)	Ppm	300	6.24		BDL
4	Nitric dioxide (NO2)	Ppm	300	1.37		BDL
5	Sulphur dioxide	Ppm	500	1.13		BDL
6	Hydrogen Cyanide (HCN)	Ppm	NS	3.75		BDL
7	Ammonia (NH3)	Ppm	NS	3.13		BDL
8	Oxygen	Ppm	NS	20.80		BDL

MLF /AS/2/ N 11' 46'27.8" E 7'37° 20'.3" E 618 m.

BDL = Below detectable limit.

MGA = M40 Gas Analyser

Ppm = Parts per million.

S/N	Parameters	Unit	NESREA	RESULT	METHOD	REMARK
	Hydrogen Sulphide (H2S)	Ppm	5	1	M40 Gas Analyser (direct reading method) (MGA)	BDL
2	Carbon monoxide (CO)	Ppm	500	0		BDL
3	Nitric Oxide (NO)	Ppm	300	6.35		BDL
4	Nitric dioxide (NO2)	Ppm	300	1.26		BDL
5	Sulphur dioxide	Ppm	500	1.12		BDL
6	Hydrogen Cyanide (HCN)	Ppm	NS	2.99		BDL
7	Ammonia (NH3)	Ppm	NS	3.12		BDL
8	Oxygen	Ppm	NS	20.80		BDL

MLF /AS/3/ N 11° 47'09.3" E 7° 36'57.2" E 613 m.

BDL = Below detectable limit.

MGA = M40 Gas Analyser

Ppm = Parts per million.

S/N	Parameters	Unit	NESREA	RESULT	METHOD	REMARK
	Hydrogen Sulphide (H2S)	Ppm	5	1.00	M40 Gas Analyser (direct reading method) (MGA)	BDL
2	Carbon monoxide (CO)	Ppm	500	0		BDL
3	Nitric Oxide (NO)	Ppm	300	6.24		BDL
4	Nitric dioxide (NO2)	Ppm	300	1.38		BDL
5	Sulphur dioxide	Ppm	500	1.14		BDL
6	Hydrogen Cyanide (HCN)	Ppm	NS	3.70		BDL
7	Ammonia (NH3)	Ppm	NS	3.30		BDL
8	Oxygen	Ppm	NS	20.80		BDL

MLF /AS/4/ N 11° 47'17.5" E 7° 37'02.6" E 607 m

BDL = Below detectable limit.

MGA = M40 Gas Analyser

Ppm = Parts per million.

S/N	Parameters	Unit	NESREA	RESULT	METHOD	REMARK
1	Hydrogen Sulphide (H2S)	Ppm	5	1.00	M40 Gas Analyser (direct reading method) (MGA)	BDL
2	Carbon monoxide (CO)	Ppm	500	1.00		BDL
3	Nitric Oxide (NO)	Ppm	300	6.25		BDL
4	Nitric dioxide (NO2)	Ppm	300	1.35		BDL
5	Sulphur dioxide	Ppm	500	1.15		BDL
6	Hydrogen Cyanide (HCN)	Ppm	NS	3.75		BDL
7	Ammonia (NH3)	Ppm	NS	3.14		BDL
8	Oxygen	Ppm	NS	20.80		BDL

MLF /AS/5/ N 11° 47'16.9' E 007° 36'49.2'' E 596 m

BDL = Below detectable limit.
MGA = M40 Gas Analyser
Ppm = Parts per million.

S/N	Parameters	Unit	NESREA	RESULT	METHOD	REMARK
1	Hydrogen Sulphide (H ₂ S)	Ppm	5	2.00	M40 Gas Analyser (direct reading method) (MGA)	BDL
2	Carbon monoxide (CO)	Ppm	500	0		BDL
3	Nitric Oxide (NO)	Ppm	300	6.25		BDL
4	Nitric dioxide (NO ₂)	Ppm	300	1.39		BDL
5	Sulphur dioxide	Ppm	500	1.13		BDL
6	Hydrogen Cyanide (HCN)	Ppm	NS	3.75		BDL
7	Ammonia (NH ₃)	Ppm	NS	3.13		BDL
8	Oxygen	Ppm	NS	20.80		BDL

Summary of Environmental, Social, Health and Safety (ESHS) Enhancements

Standard Procurement Documents (SPDs) & Standard Bidding Documents (SBDs)

Note: The following ESHS enhancements shall be applicable for all new works contracts for which the relevant SBD/SPD listed below are used. "New contracts" in this context means contracts for which the bidding documents/request for proposal documents have not yet been issued.



Summary of Environmental, Social, Health and Safety (ESHS) Enhancements

ESHS Enhancements have been made to the following procurement documents:

Standard Procurement Documents (SPD) Works

1. Prequalification Document - Works
2. Request for Bids - After Prequalification
3. Request for Bids - Without Prequalification
4. Request for Bids - Small Works One-Envelope Bidding Process
5. Request for Bids - Small Works Two-Envelope Bidding Process
6. Request for Bids - Output and Performance-Based Road Contracts

Standard Bidding Documents (SBD) Works

7. Prequalification Document - Works
8. SBD Small Works
9. SBD Works
10. SBD Output and Performance-Based Road Contracts

Consulting Services

11. Request for Proposals (RFP) Consulting Services 2015 (for supervising engineer)
12. RFP Consulting Services 2016 (for supervising engineer)

Summary of key enhancements

The following table summarizes the key enhancements that have been reflected in the SBDs and SPDs listed above.

#	Subject	Enhancement/s
1	Declaration of contract suspension or termination	<ul style="list-style-type: none"> • Applicants/Bidders/Proposers are now required to make a declaration listing any civil works contracts that have been suspended or terminated by an employer and/or performance security called by an employer, for ESHS reason/s. This information will be used to inform enhanced due diligence.
2	Strengthened specifications/ employer's requirements	<ul style="list-style-type: none"> • The Employer is required to set out clearly the minimum expectations of ESHS performance from the outset, to ensure that all Bidders/Proposers are aware of the ESHS requirements.
3	Workers' ESHS Code of Conduct	<ul style="list-style-type: none"> • Bidders/Proposers are now required to submit, as part of their Bid/Proposal, an ESHS Code of Conduct that will apply to their employees and sub-contractors, and details of how it will be enforced. • The suitability of the Code of Conduct can be assessed and discussed as part of the Bid/Proposal evaluation and negotiations. • The successful Bidder/Proposer is required to implement the agreed Code of Conduct upon contract award.
4	Contractor's ESHS Management Strategy and Implementation Plans	<ul style="list-style-type: none"> • Bidders/Proposers are now required to submit, as part of their Bid/Proposal, ESHS Management Strategies and Implementation Plans required to manage the key ESHS risks of the project. • The suitability of these strategies and plans can be assessed as part of the Bid/Proposal evaluation, and discussed during pre-contract

#	Subject	Enhancement/s
		<p>discussions, as appropriate.</p> <ul style="list-style-type: none"> • These strategies and plans will become part of the Contractor's Environmental and Social Management Plan (C-ESMP). • Particular Conditions of Contract now include provisions relating to the (C-ESMP), e.g.: <ul style="list-style-type: none"> - a requirement that the Contractor shall not commence any Works unless the Engineer is satisfied that appropriate measures are in place to address ESHS risks and impacts; - at a minimum, the Contractor shall apply the plans and ESHS Code of Conduct, submitted as part of the Bid/Proposal, from contract award onwards.
5	ESHS Performance Security	<ul style="list-style-type: none"> • The successful Bidder/Proposer is now required to provide, in addition to the standard Performance Security, an ESHS Performance Security (the sum of the two "demand" bank guarantees, normally not to exceed 10% of the contract price). • The ESHS performance security is in the form of a "demand" bank guarantee." • The application of this provision is at the Borrower's discretion. It is recommended for contracts where there is significant ESHS risks as advised by Social/Environmental specialist/s.
6	ESHS Provisional Sum	<ul style="list-style-type: none"> • An additional provisional sum, specifically for ESHS outcomes, may be included in the Request for Bids/Proposals documents, and eventual contract. Normally, the payment for the delivery of ESHS requirements shall be a subsidiary obligation of the Contractor covered under the prices quoted for other Bill of Quantity/price items.
7	Key ESHS Personnel	<ul style="list-style-type: none"> • Bidders/Proposers are now required to demonstrate that they have suitably qualified ESHS specialists among their Key Personnel. • Key Personnel must be named in the Bid/Proposal, and in the contract. • The quality of the proposed Key Personnel (including ESHS specialists) will be assessed during the evaluation of Bids/Proposals. • The Contractor shall require the Employer's consent to substitute or replace any Key Personnel. • The Engineer may require the removal of Personnel if they undertake behaviour which breaches the ESHS Code of Conduct, e.g. spreading communicable diseases, sexual harassment, gender-based violence, illicit activity, or crime.
8	ESHS Reporting	<ul style="list-style-type: none"> • Contracts now contain specific ESHS reporting requirements. These relate to: <ul style="list-style-type: none"> - ESHS incidents requiring immediate notification - ESHS metrics in regular progress reports.
9	ESHS considerations during contract variation	<ul style="list-style-type: none"> • As part of variation procedures, the Contractor shall provide relevant ESHS information to enable the Engineer to evaluate the ESHS risks and impacts.
10	Ability to withhold interim payment	<ul style="list-style-type: none"> • Contracts now contain provisions allowing interim payments to be withheld where there is a failure to perform an ESHS obligation.
11	ESHS considerations included in civil works Consulting Services	<ul style="list-style-type: none"> • The standard Request for Proposals for consulting services now include ESHS considerations to apply to the supervision of civil works.

ANNEXURE XIII: Quick Brief on ESHS

Brief on ESHS

Code of Conduct (ESHS)

The Bidder shall submit its Code of Conduct that will apply to contractor's personnel to ensure compliance with its Environmental, Social, Health and Safety (ESHS) obligations under this contract to include the following;

- a. Community and PAPs Issues Management
- b. HIV/AIDS and Health Awareness Management
- c. Public and Occupational Health and Safety Management
- d. Sexual Harassment and Gender Based Violence
- e. Illicit Drug and Alcohol Use and Behaviours
- f. Crime and Criminal Activities
- g. Grievance Redress Mechanisms (GRM)
- h. Labour Relations, Fair Compensation and Child Labour

In addition, the Bidder shall detail how this Code of Conduct will be implemented. This will include: how it will be introduced into conditions of employment/engagement, what training will be provided, how it will be monitored and how the Contractor proposes to deal with any breaches.

The Contractor shall be required to implement the agreed Code of Conduct and which will be strictly supervised by the SPMU and/or its agent(s).

Management Strategies and Implementation Plans (MSIP) to manage the (ESHS) risks

The Bidder shall submit Management Strategies and Implementation Plans (MSIP) to manage the following key Environmental, Social, Health and Safety (ESHS) risks.

1. Community and PAPs Issues Management
2. Public and Occupational Health and Safety Management
3. Dust Control and Air Quality Management
4. Noise and Vibration Exposure Management
5. Waste Management and Debris from Construction Operations
6. Flora and Fauna Removal Management
7. Grievance Redress Mechanisms (GRM)

In addition to the Code of Conduct and MSIP outlined above, the contractor shall be required to address and implement the ESHS as identified in the Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP) provided by the SPMU/WB.

Environmental, Social, Health and Safety (ESHS) Metrics for Progress Reports

The Construction Contractor shall maintain strict compliance with the following regular reporting:

- a. environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies;

- b. health and safety incidents, accidents, injuries and all fatalities that require treatment;
- c. interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none);
- d. status of all permits and agreements:
 - i. work permits: number required, number received, actions taken for those not received;
 - ii. status of permits and consents:
 - list areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, dates submitted to resident engineer (or equivalent);
 - identify major activities undertaken in each area for each month and highlights of environmental and social protection (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation);
- e. health and safety supervision:
 - i) safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;
 - ii) number of workers, work hours, use of PPE (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);
- f. worker accommodations:
 - i) number of expatriates housed in accommodations, number of locals;
 - ii) date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;
 - iii) actions taken to recommend/require improved conditions, or to improve conditions.
- g. HIV/AIDS: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);
- h. gender (for expatriates and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);
- i. training:
 - i) number of new workers, number receiving induction training, dates of induction training;
 - ii) number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;

- iii) number and dates of HIV/AIDS sensitization training, no. workers receiving training (monthly); same questions for gender sensitization, flaglady/flagman training.
- j. environmental and social supervision:
 - i) environmentalist: days worked, areas inspected and numbers of inspections of each work sections, work camp, accommodations, borrow areas, spoil areas, etc.; highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to SPMU/FPMU environmental and/or social safeguards officers and construction/site management;
 - ii) sociologist: days worked, number of partial and full site inspections (by area: work sections, work camp, accommodations, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, etc.), highlights of activities (including violations of environmental and/or social requirements observed, actions taken), reports to environmental and/or social safeguards officers and construction/site management; and
 - iii) community liaison person(s): days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), reports to environmental and/or social safeguards officers and construction/site management.
- k. Grievances: list for each month unresolved grievances by date received, complainant, how received, to whom referred for action, resolution and date (if completed), date resolution reported to complainant, any required follow-up (Cross-reference other sections as needed):
 - i) Worker grievances;
 - ii) Community grievances
- l. Traffic and vehicles/equipment:
 - i) traffic accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;
 - ii) accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;
 - iii) overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control emissions, etc.).
- m. Environmental mitigations and issues (what has been done):
 - i) dust: number of working bowsers, number of waterings/day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of construction dust control (covers, sprays, operational status); % of soil/spoil/waste lorries with covers, actions taken for uncovered vehicles;
 - ii) erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to

resolve issues, emergency repairs needed to control erosion/sedimentation;

- iii) borrow areas, spoil areas: identify major activities undertaken each month, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;
- iv) spill cleanups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination);
- v) waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;
- vi) details of tree plantings and other mitigations required and undertaken each month;
- vii) details of water protection mitigations required and undertaken each month.

n. compliance:

- i) compliance status of ESMP/ESIP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
- ii) other unresolved issues from month to month related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or borrowing issues, etc. Cross-reference other sections as needed.

ANNEXURE XIV: Construction Daily Monitoring Checklist

The following checklists from Occupational Safety and Health Administration (OSHA) provide necessary steps to avoid hazards that cause injuries, illnesses and fatalities. OSHA states, "As always, be cautious and seek help if you are concerned about a potential hazard."

Personal Protective Equipment (PPE)

Eye and Face Protection

- Safety glasses or face shields are worn anytime work operations can cause foreign objects getting into the eye such as during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles).
- Eye and face protectors are selected based on anticipated hazards.
- Safety glasses or face shields are worn when exposed to any electrical hazards including work on energized electrical systems.

Foot Protection

- Construction workers should wear work shoes or boots with slip-resistant and puncture-resistant soles.
- Safety-toed footwear is worn to prevent crushed toes when working around heavy equipment or falling objects.

Hand Protection

- Gloves should fit snugly.
- Workers wear the right gloves for the job (for example, heavy-duty rubber gloves for concrete work, welding gloves for welding, insulated gloves and sleeves when exposed to electrical hazards).

Head Protection

- Workers shall wear hard hats where there is a potential for objects falling from above, bumps to their heads from fixed objects, or of accidental head contact with electrical hazards.
- Hard hats are routinely inspected for dents, cracks or deterioration.
- Hard hats are replaced after a heavy blow or electrical shock.
- Hard hats are maintained in good condition.

Scaffolding

- Scaffolds should be set on sound footing.
- Damaged parts that affect the strength of the scaffold are taken out of service.
- Scaffolds are not altered.
- All scaffolds should be fully planked.
- Scaffolds are not moved horizontally while workers are on them unless they are designed to be mobile and workers have been trained in the proper procedures.
- Employees are not permitted to work on scaffolds when covered with snow, ice, or other slippery materials.
- Scaffolds are not erected or moved within 10 feet of power lines.
- Employees are not permitted to work on scaffolds in bad weather or high winds unless a competent person has determined that it is safe to do so.
- Ladders, boxes, barrels, buckets or other makeshift platforms are not used to raise work height.
- Extra material is not allowed to build up on scaffold platforms.
- Scaffolds should not be loaded with more weight than they were designed to support.

Electrical Safety

- Work on new and existing energized (hot) electrical circuits is prohibited until all power is shut off and grounds are attached.
- An effective Lockout/Tagout system is in place.
- Frayed, damaged or worn electrical cords or cables are promptly replaced.
- All extension cords have grounding prongs.
- Protect flexible cords and cables from damage. Sharp corners and projections should be avoided.
- Use extension cord sets used with portable electric tools and appliances that are the three-wire type and designed for hard or extra-hard service. (Look for some of the following letters imprinted on the casing: S, ST, SO, STO.)
- All electrical tools and equipment are maintained in safe condition and checked regularly for defects and taken out of service if a defect is found.
- Do not bypass any protective system or device designed to protect employees from contact with electrical energy.
- Overhead electrical power lines are located and identified.
- Ensure that ladders, scaffolds, equipment or materials never come within 10 feet of electrical power lines.
- All electrical tools must be properly grounded unless they are of the double insulated type.
- Multiple plug adapters are prohibited.

Floor and Wall Openings

- Floor openings (12 inches or more) are guarded by a secured cover, a guardrail or equivalent on all sides (except at entrances to stairways).
- Toeboards are installed around the edges of permanent floor openings (where persons may pass below the opening).
- Elevated Surfaces
- Signs are posted, when appropriate, showing the elevated surface load capacity.
- Surfaces elevated more than 48 inches above the floor or ground have standard guardrails.
- All elevated surfaces (beneath which people or machinery could be exposed to falling objects) have standard 4-inch toeboards.
- A permanent means of entry and exit with handrails is provided to elevated storage and work surfaces.
- Material is piled, stacked or racked in a way that prevents it from tipping, falling, collapsing, rolling or spreading.

Hazard Communication

- A list of hazardous substances used in the workplace is maintained and readily available at the worksite.
- There is a written hazard communication program addressing Safety Data Sheets (SDS), labeling and employee training.
- Each container of a hazardous substance (vats, bottles, storage tanks) is labeled with product identity and a hazard warning(s) (communicating the specific health hazards and physical hazards).
- Safety Data Sheets are readily available at all times for each hazardous substance used.
- There is an effective employee training program for hazardous substances.

Crane Safety

- Cranes and derricks are restricted from operating within 10 feet of any electrical power line.

- The upper rotating structure supporting the boom and materials being handled is provided with an electrical ground while working near energized transmitter towers.
- Rated load capacities, operating speed and instructions are posted and visible to the operator.
- Cranes are equipped with a load chart.
- The operator understands and uses the load chart.
- The operator can determine the angle and length of the crane boom at all times.
- Crane machinery and other rigging equipment is inspected daily prior to use to make sure that it is in good condition.
- Accessible areas within the crane's swing radius are barricaded.
- Tag lines are used to prevent dangerous swing or spin of materials when raised or lowered by a crane or derrick.
- Illustrations of hand signals to crane and derrick operators are posted on the job site.
- The signal person uses correct signals for the crane operator to follow.
- Crane outriggers are extended when required.
- Crane platforms and walkways have antiskid surfaces.
- Broken, worn or damaged wire rope is removed from service.
- Guardrails, hand holds and steps are provided for safe and easy access to and from all areas of the crane.
- Load testing reports/certifications are available.
- Tower crane mast bolts are properly torqued to the manufacturer's specifications.
- Overload limits are tested and correctly set.
- The maximum acceptable load and the last test results are posted on the crane.
- Initial and annual inspections of all hoisting and rigging equipment are performed and reports are maintained.
- Only properly trained and qualified operators are allowed to work with hoisting and rigging equipment.

Forklifts

- Forklift truck operators are competent to operate these vehicles safely as demonstrated by their successful completion of training and evaluation.
- No employee under 18 years old is allowed to operate a forklift.
- Forklifts are inspected daily for proper condition of brakes, horns, steering, forks and tires.
- Powered industrial trucks (forklifts) meet the design and construction requirements established in American National Standards Institute (ANSI) for Powered Industrial Trucks, Part II ANSI B56.1-1969.
- Written approval from the truck manufacturer is obtained for any modification or additions which affect capacity and safe operation of the vehicle.
- Capacity, operation and maintenance instruction plates, tags or decals are changed to indicate any modifications or additions to the vehicle.
- Battery charging is conducted in areas specifically designated for that purpose.
- Material handling equipment is provided for handling batteries, including conveyors, overhead hoists or equivalent devices.
- Reinstalled batteries are properly positioned and secured in the truck.
- Smoking is prohibited in battery charging areas.
- Precautions are taken to prevent open flames, sparks or electric arcs in battery charging areas.

- Refresher training is provided and an evaluation is conducted whenever a forklift operator has been observed operating the vehicle in an unsafe manner and when an operator is assigned to drive a different type of truck.
- Load and forks are fully lowered, controls neutralized, power shut off and brakes set when a powered industrial truck is left unattended.
- There is sufficient headroom for the forklift and operator under overhead installations, lights, pipes, sprinkler systems, etc.
- Overhead guards are in place to protect the operator against falling objects.
- Trucks are operated at a safe speed.
- All loads are kept stable, safely arranged and fit within the rated capacity of the truck.
- Unsafe and defective trucks are removed from service.

Source: OSHA

ANNEXURE XV: Discussion Of Methods/Techniques Used In Assessing Impacts

Impact Rating Methodology

The assessment of the potential impacts of the project was based on specialists’ expertise, Consultant’s professional judgment, field observations and desk-top analysis. The significance of potential impacts that may result from the proposed project was determined to assist decision making.

Generally, the envisaged areas of potential impacts which could result from the activities of the project are evaluated for impact significance based on the comparative consequential effects of the potential impact on the social and biophysical environments. The significance of an impact may be defined as a combination of the consequence of the impact occurring and the probability that it will occur. The criteria used to determine impact consequence are shown in the Table 5-1.

Table 5.1: Criteria for Determining Impact Consequence

RATING	DESCRIPTION OF RATING	SCORE
A. Extent – the area over which the impact will be experienced		
Localized	Confined to specific project activity area or part thereof	1
Entire Watershed	The entire watershed	2
Regional	Beyond the watershed	3
B. Intensity – the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions and processes are severely altered	3
C. Duration – the timeframe over which the impact will be experienced and its reversibility		
Short-term	Up to 6 months	1
Medium-term	6 months to 1 year	2
Long-term	More than 1 year	3

The numerical scores in Table 5-1 are positive or negative depending on whether the impact is adverse or beneficial. If impact is adverse, the numerical score is positive and if the impact is beneficial, the numerical score is negative. The combined score of the three criteria (extent, intensity and duration) corresponds to a Consequence Rating, as shown in Table 5-2:

Table 5-2: Method used to determine Consequence Score

Combined Score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

The probability of the impact occurring is determined using the probability classifications presented in the Table 5-3 below:

Table 5-3: Probability Classification

Probability – the likelihood of impact occurring	
Improbable	< 40% chance of occurring
Possible	40% – 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall significance of impacts was determined by considering consequence and probability using the rating system prescribed in the Table 5-4 below:

Table 5-4: Impact Significance Ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	Low	VERY LOW	VERY LOW	LOW	LOW
	Medium	LOW	LOW	MEDIUM	MEDIUM
	High	MEDIUM	MEDIUM	HIGH	HIGH
	Very High	HIGH	HIGH	VERY HIGH	VERY HIGH