Early Production System EIA

Annexes:

Environmental Impact Assessment for the Proposed Early Production System, Kaiso-Tonya Area, Block 2, Lake Albert, Uganda.

March 2008

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Tullow Uganda Operations (Pty) Ltd

Early Production System EIA:

ANNEXES

Environmental Impact Assessment for the Proposed Early Production System, Kaiso-Tonya Area, Block 2, Lake Albert, Uganda

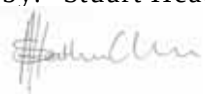
March 2008

Reference 0068662

Prepared by: Environmental Resources Management (ERM) Southern Africa (Pty) Ltd; and Environmental Assessment Consult Limited (EACL)

For and on behalf of
Environmental Resources Management

Approved by: Stuart Heather-Clark

Signed: 

Position: Partner-in-Charge

Date: 29 February 2008

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Annex A

Sub-contractor Terms of Reference

A1 TERMS OF REFERENCE FOR THE BASELINE / SPECIALIST STUDIES

Detailed Terms of Reference for the baseline studies to be undertaken as part of the EIA are outlined below.

A1.1 AIR QUALITY STUDY

Scoping study

Emissions to atmosphere will be associated with the processing of crude at the topping unit, the combustion of heavy fuel oil to generate power and the miscellaneous use of energy for product transmission and production activities. Of these, the most significant is the 50 MW power station. Pollutants from this source will include oxides of nitrogen, sulphur dioxide (if the heavy fuel oil contains sulphur), carbon monoxide, particulate matter and some unburned hydrocarbons.

The impact on the local air quality will depend, in part, on the height of the stack chosen, as well as such factors as the choice of technology and the hours of operation. A combustion source of this size will emit pollutants such as NOx and SO2, probably at rates of less than 1 g s-1, depending on the fuel and technology used.

Emissions on the scale described above should not cause a significant impact to local air quality, as assessed against air quality standards and existing air quality, provided that reasonable stack heights are chosen for larger point sources.

It is possible, in these circumstances, to be able to conclude that no significant impacts will occur on the basis of a simple screening approach, using well understood dispersion relationships between stack heights and ground level concentrations. Provided that the existing air quality is understood sufficiently, it should be possible to show that the additional impact will not be significant. Cumulative impacts will also be considered as part of this specialist study.

To determine emissions to atmosphere, ERM will need to assemble an inventory of sources, each described in terms of:

- Source type, e.g. combustion, vehicle movements;
- Source location;
- Release height and stack diameter (where relevant);
- Volume flow rate for point sources;
- Exit temperature for point sources; and
- Pollutant emissions (in mg m^{-3} at reference conditions or g s^{-1}).

Any information on the existing environment, such as background air quality or sensitive receptors in the vicinity, will be required.

Dispersion modelling (more comprehensive study if required)

If it becomes necessary to investigate the assessment of impacts at a higher level of sophistication, then a dispersion model, such as AERMOD or ADMS, can be used to quantify the additional ground level concentrations from the more significant emission sources. Such models would be run with meteorological data based on observations at a suitable station in the area (and purchased commercially in 'model ready' form) or generated by a numerical weather prediction model for the precise geographical location. Additionally, the terrain should be input to the model, as a digital file.

Use of a dispersion model could become necessary if a regulator or planning authority wished to have more precise information on the impact at selected receptors of importance.

It may also become necessary to understand the health impacts of the ground level concentration of air pollutants. In this case, any estimates of ground level concentrations will need to be evaluated against international air quality standards, which are health based. This does not include a full health impact assessment, but rather a comparison of modelled ground level concentrations to specific international health standards.

Health impact assessment

Human health effects can be considered if required. ERM have a licence to run IRAP, a model that uses the US EPA Human Health Risk Assessment protocol and ERM have also developed techniques to quantify the mortality and morbidity effects of exposure to PM10, NO2 and SO2. However, it is unlikely that this level of study will be required and no cost is provided for this in the overall budget.

A1.2 SOCIO-ECONOMIC STUDY

The Kaiso-Tonya valley is a sparsely populated and in the past has been fairly inaccessible until recently when the road into the valley was upgraded as a result of the oil exploration activities. There are numerous fishing villages along the lake shore that are dependant on the lake resources for their daily subsistence. They are exceptionally poor communities that have very little access to adequate infrastructure. A tourism operator is also present in the area and utilises the Kabwoya Wildlife Reserve and surrounding areas. As a result of the recent exploration drilling activities in the basin, changes tot he area have been experienced by the communities.

With the proposed development of an Early Production System in the Kaiso-Tonya valley, there will certainly be significant social and economic changes

experienced in both the short and long-term. As such, there are two distinct aspects that the Socio-Economic Study will take into consideration:

- The **construction phase** will bring with it an influx of expatriate workers brought into the area for the duration of construction. This could bring about inevitable changes to the social fabric of the area, including for example, an increase in alcoholism, prostitution, prevalence of HIV/AIDS etc. With the possibility of employment, there is likely to be an in-migration of job-seekers into the area, placing more pressure on the already scarce infrastructure and natural resources in the area. The construction of the EPS and its associated facilities will also have an impact on any tourism in the area.

- The **operational phase** could potentially have a notable impact on the tourism and conservation activities in the valley. The industrial nature of the development could change the sense of place for both the potential tourists as well as for the local communities. Given the dependence of the communities on the lake resources, any pollution could significantly alter their ability to sustain themselves. The plant will be a source of employment for some local people and will be able to provide positive contributions through structured Corporate Social Investment Programmes. However, the investment by the oil sector could also lead to conflicts amongst the communities as perception of unfair investment in one village as apposed to another may result. Conflict may be perpetuated as a result of unmet expectation in terms of direct benefits to the local communities. These perceptions and unmet expectation could severely hamper Tullow's "social" license to operate and need to be adequately understood in order be effectively managed.

Overall, the proposed development could bring about a range of positive and negative impacts that would need to be managed in such a way that the positive contributions are accentuated and the potential negative impacts are minimised or mitigated. In order to better understand, identify and manage the potential impacts of the proposed Early Production System, the Socio-Economic Study will:

- **Compile a detailed social and economic profile** that will serve to provide a baseline of the existing communities. The profile will address areas such as; the local demographics, land ownership and land use patterns, standards of living, forms of livelihood (wage and non-wage based), levels of education, skills and employment/unemployment, health, administrative structures and relations between traditional and civic authorities, cultural sensitivities, identification of sacred areas, and availability of infrastructure and services.

- **Identify and analyse the potential positive and negative socio-economic impacts including cumulative impacts** associated with the construction and operation of the Early Production System. These will be identified

through consultation with relevant authorities, stakeholders and communities.

- **Develop management responses and associated impact management plans** in response to the impacts identified through the impact identification phase. Examples of such responses could be comprehensive human resources and skills development programmes, Corporate Social Responsibility initiatives and on-going monitoring and evaluation systems.

A1.3 WASTE MANAGEMENT STUDY

It will be important to ensure that all wastes generated during the life-cycle of the project are identified and classified and appropriate waste management strategies developed. It is acknowledged that international best practice will follow an integrated waste management approach based on the waste hierarchy, i.e. in order of preference - waste avoidance; waste recycling, re-use and utilisation; waste treatment and finally waste disposal. However, due to the remoteness of the area, the lack of any hazardous waste disposal facilities and the sensitivity of the receiving environment, the disposal of waste will need to be thoroughly investigated.

Because of the lack of information as to the technology to be used and as a result the wastes to be generated it is proposed that this study also be undertaken in a phased approach.

Scoping study

During this phase the following is proposed:

- Review all applicable Ugandan legal requirements, regulations and guidelines and, where none are available, UN, World Bank, IFC or other international requirements;
- The quantification and classification of hazardous chemicals used and wastes generated during construction, commissioning, operation and during closure/decommissioning;
- The identification and initial assessment of waste management actions that may be required, including the disposal of hazardous wastes.

Should the initial assessment identify the need for disposal of hazardous waste in and around the project area and should the groundwater study reveal that the area has significant sensitive receptors, a more detail waste management study will be recommended.

A1.4 GROUND AND SURFACE WATER STUDY

In an area such as the Kaiso-Tonya valley, villages largely depend on the lake as a source of water. However, the lake water is in many areas serves

simultaneously as drinking water sources, bathing and laundry places, fish cleaning and rubbish waste disposal sites. This together with unsanitary land based latrine facilities places substantial pressure on the water resources (lake, groundwater and surface water), leaving limited uncontaminated fresh water available for safe consumption. As a result it is critically important to understand the surface and groundwater status in the area to ensure that further pressure (via contamination) does not occur. In order to assess the potential impacts on surface and groundwater the following will be undertaken:

Review of existing information

All available information will be reviewed in a desk top study to identify the sensitivity and vulnerability of surface and groundwater reserves in the area. Information that will be considered will include relevant geological, topographical and orthographical maps, available technical reports, and existing EIA reports. The groundwater will be characterised in terms of groundwater flows, quality and location of sensitive receptors.

Groundwater characterisation

A site visit will be undertaken to better understand the local conditions. During this visit a visual evaluation of surrounding land uses and sensitive receptors (protected natural areas, community wells, rivers and wetland etc) will also be performed.

Water quality baseline will be colleted in order to determine baseline water quality parameters of surface water resources especially streams and rivers in the project area. Water quality baseline data will be gathered for the following constituents:

- Temperature;
- pH;
- Dissolved oxygen;
- Conductivity with portable meter(s);
- Transparency measured by Secchi Disc and underwater photometer;
- Total dissolved solutes (TDS);
- Nitrogen (Ammonia, Nitrates, Total dissolved Nitrogen, Total Nitrogen);
- Phosphorus (soluble reactive Phosphorus, Total dissolved Phosphorus, Total Phosphorus);
- Oil and grease; and
- Chlorophyll.

A limited hydrocensus of the proposed site and surrounding areas will be carried out to identify surface and groundwater users in the area. If boreholes are encountered, relevant hydrological data will be captured, if available, such as water levels and yields, and water samples will be taken for analysis, if practically possible. Water quality analysis will provide a baseline against which ongoing monitoring can be based.

This will result in a better understanding of the groundwater conditions in the project area which will allow a better understanding of the potential impacts on the sensitive receptors, including cumulative impacts. Appropriate mitigation and management measures with regards to waste management/disposal, storm water management etc will be developed. Detailed monitoring will also be recommended in order to monitor potential impacts on ground and surface water.

The groundwater study excludes any groundwater modelling that may be required to better characterise the direction of groundwater flows and the possible linkages to the Lake and other sensitive areas such as wetlands and rivers. It also excludes any drilling of additional boreholes to provide more detailed baseline on water quality of the area.

A1.5 FLORA AND FAUNA STUDIES

A detailed description of the fauna and flora of the proposed site and surrounding area will be provided. The majority of information used will be sourced from existing EIAs. A site visit will be required, and should alternative sites be identified, all sites will need to be visited.

The proximity of the site and proposed project footprint to sensitive areas such as wetland areas, conservation/protected areas and sensitive habitats will be identified and mapped and appropriate mitigation actions recommended.

Documentation of the baseline information on chosen Taxa will be carried out. The information generated will provide a basis for future monitoring of changes in diversity and population of the various floral and faunal groups. This will provide a basis for understanding the specific impact of the Early Production System on the environment, including cumulative impacts and provide a basis for corrective measures to be implemented.

Biodiversity groups selected for survey include the following:

- Vegetation;
- Birds;
- Mammals;
- Frogs and reptiles; and
- Invertebrates (butterflies and dragonflies).

Vegetation survey

The objective of the vegetation survey is to determine the species richness and abundance in the area of study and determine the conservation status of the species identified.

The survey will comprehensively:

- Provide a description of the nature and characteristics of the baseline vegetation resources of the area;
- Provide a checklist of the vegetation in the area;
- Define the criteria against which, impacts on vegetation resources will be evaluated;
- Establish ecological status of the biodiversity in the project area and its environs and the likely impacts as a result of the oil production system;
- Provide a scenario trend of the vegetation in the area in the event that, the project is not implemented (No Project Option);
- Provide community use of the plant resources in relation with biodiversity conservation;
- Identify the direct and indirect impacts of the oil production system on flora in the area;
- Describe clear monitoring indicators and regimes for the implications of the proposed development on the vegetation resources in the area; and
- For significant impacts, recommend appropriate short and/or long-term mitigation measures/plan to reduce adverse negative impacts on the vegetation resources.

Ornithological survey

The objective of the ornithological investigations is to determine the species diversity and abundance in the area of study and determine the conservation status of the species identified. The survey will comprehensively:

- Identify and document as far as possible, distribution and relative abundance of the baseline avifauna data in terms of; habitats, resident and migratory species in the proposed project area. A short description of distribution of the habitats (on ornithological perspective) in the surrounding areas should be given;
- Document the existing/baseline situation to serve as a basis for identification of impacts. In addition, appropriate institutional responsibilities and needed input should be indicated;
- Define the criteria against which, impacts on birds will be evaluated;
- Provide description of the conservation status of the birds occurring in the area (rare, vulnerable, threatened as in IUCN Red Data Book);
- Identify and assess the potential environmental short and long-term impacts (positive and negative) of the project on the avifauna in the area;
- Describe likely ornithological trends anticipated as well as likely development in the avifauna with/without implementation of the project;
- Propose feasible mitigation plans for any adverse negative impacts of the project to reduce their implications on the environment;
- Describe clear monitoring ornithological indicators and regimes for monitoring the implications of the development on the avifauna in the area.

Zoological survey (Vertebrates-mammals, frogs & reptiles; Invertebrates, butterflies & dragonflies)

The objective of the zoological investigations is to determine the species diversity and abundance in the area of study and determine the conservation status of the species identified. The survey will comprehensively:

- Identify and document as far as possible, presence, distribution and relative abundance of the named faunal groups in the proposed area;
- Define the criteria against which impacts on the above fauna will be evaluated;
- Describe the conservation status of the fauna occurring in the area (rare, endemic, threatened etc);
- Describe any special precautions that may be required in establishing the project pertaining to the protection of these groups;
- Identify and assess the potential environmental short and long-term impacts of the project on the fauna in the area;
- Describe clear monitoring indicators and regimes for monitoring the implications of the development on the groups of fauna in the area;
- Propose appropriate mitigation and management measures/plan to reduce any adverse negative environmental impacts on the fauna both during the construction and operation phases of the project.

A1.6 NOISE STUDY

The surrounding Kaiso Tonya area has a rural characteristic with small fishing villages located along the banks of Lake Albert and a tourist facility that utilises the Kabwoya Wildlife Reserve. Apart from the exploration drilling activities there are not industrial or other major noise generating economic activities in the area. As a result of the rural nature of the area and the absence of major noise sources in the area, a noise specialist study will be undertaken to quantify the noise impacts, including any cumulative impacts. The specialist study on noise impacts will address the following:

- Determine the land use zoning and identify all potential noise sensitive sites that could be impacted upon by activities relating to operation of the Early Production System and associated power plant;
- Identify all noise sources relating to the activities of the facility during construction phase and operation phase that could potentially result in a noise impact at the identified noise sensitive sites;
- Determine the sound emission, operating cycle and nature of the sound emission from each of the identified noise sources;
- Calculate the combined sound power level due to the sound emissions of the individual noise sources;
- Calculate the expected rating level of sound at the identified noise sensitive sites from the combined sound power level emanating from identified noise sources;

- Determine the existing ambient levels of noise at identified noise sensitive sites by conducting representative sound measurements i.e. baseline noise measurements;
- Determine the acceptable rating level for noise at the identified noise sensitive sites;
- Calculate the noise impact at identified noise sensitive sites;
- Assess the noise impact at identified noise sensitive sites in terms of local standards, World Health Organisation or World Bank standards;
- Investigate alternative noise mitigation procedures, if required, in collaboration with the design engineers of the facility and estimate the impact of noise upon implementation of such procedures;
- Prepare and submit an environmental impact report containing the procedures and findings of the investigation; and
- Prepare and submit recommended noise mitigation procedures as part of a separate environmental noise management plan, if relevant.

A1.7 VISUAL STUDY

The surrounding Kaiso Tonya area has a rural characteristic with small fishing villages located along the banks of Lake Albert and a tourist facility that utilises the Kabwoya Wildlife Reserve. The development of an industrial facility such as an Early Production System and associated power plant in the area is likely to be visually obtrusive and there is a need to assess the visual impact of the propose facility, including any cumulative impacts.

To assess the visual impacts the specialist study will address the following:

- Determine the key points from which the EPS might be visible (including all alternatives sites);
- Identify possible sensitive receptors (e.g. settlements, tourism facilities, mountain tops, access roads to the valley etc) and photograph view sheds from receptors to potential sites of the facility;
- Use photographs of view sheds from various view points and sensitive receptors to determine the view of the facility;
- Assess the visual impact from various view points and from sensitive receptors;
- Consider the likely infrastructure location alternatives to determine the implications on the view points and sensitive receptors; and
- Make recommendations on preferred infrastructure location from a visual perspective and on how visual disturbance can be minimised.

A1.8 ARCHAEOLOGICAL AND CULTURAL RESOURCES STUDY

The Albertine Graben has a rich history resulting in a diverse archaeological and cultural heritage. There is also a high probability that there are a number of cultural sites which are yet to be identified within the Albertine Graben. To

assess the impact, including cumulative impact, on archaeological and cultural heritage the specialist study will address the following:

- Conduct a systematic survey of each of the alternative sites to locate, identify and describe sites of archaeological, historical or cultural interest that may be impacted on by the location of the facility;
- This may include liaison with the relevant community concerning sites of significance;
- Indicate all sites of importance on geo-referenced map;
- Analyse any material found during site visits to establish preliminary significance of sites/ material, and development of a register of sites and relevant material;
- Describe the importance or significance of these sites and whether these sites need to be conserved, protected or relocated; and
- Describe the procedures for conservation, protection or relocation of sites and provide an indication of time and costs required for these management measures to be implemented.

Annex B

Impact Assessment Methodology

B1 IMPACT ASSESSMENT METHODOLOGY

The purpose of impact assessment and mitigation is:

- to identify and evaluate the likely extent and significance of the potential impacts on identified receptors and resources according to defined assessment criteria;
- to develop and describe measures that will be taken to avoid, minimise, reduce or compensate for any potential adverse impacts; and
- to report the significance of the residual impacts that remain following mitigation.

There are a number of ways that impacts may be described and quantified. An impact is essentially any change to a resource or receptor brought about by the presence of the project or by the execution of a project related activity. The significance of each potential impact is assessed for the construction and operation phases of the development. A high level assessment of the overall decommissioning and closure phase has also been completed. The potential impacts have been assessed according to predetermined assessment criteria which define the impact significance according to impact severity and impact probability. The criteria used to identify the significance of each impact are outlined below.

B1.1 ASSESSMENT CRITERIA

Impact Severity: *negligible*, *low*, *medium*, or *high* - the severity of an impact is a function of a range of considerations including nature, extent, duration, intensity and ability to adapt (specific to socio-economic assessment) as outlined below:

- **Impact Nature:** *positive/negative* and *direct/indirect* impact

- **Impact Extent**: A description of the scale of impact: i.e.:
  - *Local* – Kaiso-Tonya Valley, be more specific if required;
  - *District;*
  - *National;* or
  - *International.*

- **Impact Duration**: A prediction of the lifetime of the impact: i.e.:
  - *Temporary* - impacts are predicted to be of short duration and intermittent/occasional in nature.
  - *Short-term* - impacts that are predicted to last only for the duration of the construction period.
  - *Long-term* - impacts that will continue for the life of the project, but cease when the Project stops operating. Includes intermittent or repeated impacts.

- *Permanent* - impacts that occur during the development of the Project and cause a permanent change in the affected receptor or resource that endures substantially beyond the Project lifetime.

- **Impact Intensity**: A description of the magnitude/size of the impact (specialist studies attempt to quantify the magnitude of impacts and outline the rationale used. Where appropriate, national standards are used as a measure of the level of impact): i.e.:
  - *high*;
  - *medium*;
  - *low*; or
  - *negligible* (no impact).

- **Ability to Adapt:** Sensitivity of resources and receptors
  - *High Negative*: Affected stakeholders are unlikely to adapt;
  - *Low Negative*: Affected stakeholders will adapt, but it will be a struggle;
  - *High Positive*: Potential beneficiaries can easily adapt and fully maximise the opportunities available; or
  - *Low Positive*: Potential beneficiaries will adapt and make use of the opportunities, but not with as much ease as the 'high positives'.

Probability of Occurrence: A description of the probability of the impact actually occurring as: improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact would occur regardless of prevention measures).

Impact Significance (importance): An assessment of the potential impacts in terms of importance using all the above criteria (*severity x probability*). The significance is described as:

- *Negligible*: resource or receptor (including people) will not be affected in any way by the project activity;
- *Low*: an impact for which no mitigation is necessary;
- *Medium*: an impact that requires effective mitigation; or
- *High*: an impact, which, if not mitigated, could stop the project from proceeding.

In addition, the specialists were also required to specify the following:

Degree of confidence in predictions: The degree of confidence in the predictions, based on the availability of information and specialist knowledge.

B1.2 SIGNIFICANCE RATING

A significant impact has been defined for the purpose of this project, as an impact that, either in isolation or combination with others, should (in the opinion of the EIA team) be taken into account in the decision-making process.

The process for combining the severity of positive impacts with the probability of the impact occurring to determine the final significance rating is shown as a matrix in *Table 1.1.*

Table 1.1 Matrix for the Evaluation of Significance of Positive Impacts

Impact Severity	Impact Probability			
	Improbable	Probable	Highly probable	Definite
Negligible	Negligible	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible - Low	Low
Medium	Negligible	Low	Low - Medium	Medium
High	Low	Medium	Medium - High	High

The process for combining the severity of negative impacts with the probability of the impact occurring to determine the final significance rating is shown as a matrix in *Table 1.2*.

Table 1.2 Matrix for the Evaluation of Significance of Negative Impacts

Impact Severity	Impact Probability			
	Improbable	Probable	Highly probable	Definite
Negligible	Negligible	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible - Low	Low
Medium	Negligible	Low	Low - Medium	Medium
High	Low	Medium	Medium - High	High

B1.3 MITIGATION

The mitigation measures are developed to avoid, minimise, reduce, remedy or compensate for the negative impacts identified, and to create or enhance environmental and socio-economic benefits. These measures are often established through legal or best practice standards.

High negative impacts are generally considered to be unacceptable and hence require mitigation. In some instances a high negative impact may be offset by a positive impact of similar intensity, and in such situations the relative importance of the impacts must be considered in assessing their acceptability. For medium negative impacts, the focus of specific mitigation measures is to reduce these to as low as reasonably practicable. Low impacts are generally controlled through the adoption of best practice management measures.

B1.4 RESIDUAL IMPACTS

A residual impact is the impact that is predicted to remain once mitigation measures have been implemented. The significance of the residual impact will be assessed as per the methodology described above and reported in the EIS.

B1.5 DEALING WITH UNCERTAINTY

Even with a final design and an unchanging environment, impacts are difficult to predict with certainty. Potential impacts may be assessed using tools ranging from quantitative techniques such as hydrodynamic modelling to qualitative techniques based on expert judgment and historical information. The accuracy of these assessment tools depends on the quality of the input data and available information. Where assumptions have been made, the nature of any uncertainties associated with the assumption will be discussed. For qualitative predictions / assessments some uncertainty is removed through consultation.

In projects such as the EPS where the design process is currently in progress, uncertainty stemming from ongoing development of the project design is inevitable. When such uncertainties are material to EIA findings, they will be clearly stated and will be approached conservatively ('the precautionary approach') in order to identify the broadest range of likely residual impacts and necessary mitigation measures.

Annex C

Stakeholder Consultation Meeting Minutes

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Kisozi House – Uganda Media Trust for Environment
Date of Meeting	Monday 16 July 2007 , 3-4pm
Present	Mr. Peter Wamboga –Mugirya – Vice Chairman of EJAU (Uganda Media Trust for Environment is also a member of the Environmental Journalists Association of Uganda). Ms. Zöe Day - ERM Ms. Sheila Namuwaya - EACL
Distribution	
Date	16 July 2007

Introduction

The introduction was given by Zöe Day. She introduced herself and the subject of the meeting. Since Mr. Wamboga had received and read the background information document (BID), Zöe provided a brief introduction of the proposed EPS project. Zöe Day also stated that the EIA process has begun and this was the first part of the study which involved stakeholder consultation to obtain their views, opinions and concerns about the proposed project.

She outlined that a number of alternative sites are being considered for the location of the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1*:* Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

Alternative 2*:* Further East outside the Kobwoya Wildlife area i.e. within the Kaiso Tonya Community Wildlife Area on the opposite side of the Hohwa River.

Alternative 3: Within the Kabwoya Wildlife Reserve but more south of Mputa 2 and 3 close to the base of the escarpment.

Alternative 4: Outside both the Kabwoya Wildlife Reserve and the Kaiso Tonya Community Wildlife Area, to the south-west of the Ngassa Spit.

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells and injection wells will be connected via flow lines to the central processing facility of the EPS. The oil

has a high wax content and this leads to a high pour point (40^{o}C). In other words if the oil reaches any temperature below 40^{o}C it will solidify. It is thus not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha [(1)]. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The amount of water needed for the project is 5000 barrels of water per day (bpd). But this is set to reduce over time there will be sufficient quantities provided. There is likely to be pipes to pump water into the EPS for use in maintain the oil pressure as it is pumped from the underground reservoirs. The water is to be recycled and or re-used after being cleaned.

The studies to be carried out will include:

- Hydrology
- Socio- economic
- Biodiversity including flora and fauna
- Air quality
- Visual and Noise – proposed at this stage

Mr. Wamboga welcomed us and stated that he was glad to have been involved in the consultation process for the proposed EPS.

Issues raised during the meeting

- How many people are in the area?
- Are there any major forests in the area?
- What safe guards have been planned with reference to the processing of oil? For example oil spillage – what would Tullow do to clean up the oil spillage for example in the Lake Albert especially with reference to Alternative Site 4.
- HFO burning gives off smoke which contains gases like carbon monoxide which is a poisonous gas which is a Green House Gas (GHG). What amount will be produced from the entire system? How does Tullow plan to minimise pollution?
- During the flaring of the oil, heat and smoke will be produced. There is

(1) Naptha is one of the intermediate products from the distillation of crude oil. It is a liquid intermediate between the light gases in the crude oil and the heavier liquid kerosene.

need to minimise their impact on the environment. Which gas will be flared?

- Given the type of vegetation, will there be any mechanisms to reduce the risks which are presented especially during the flaring? Will the flaring be carried out in a confined area?
- In the long run the underground water will be affected. How much water is going to be drawn out?
- We would like to see the transformation of the local people at the site. How are the local people benefiting? We would not like to see a repeat of what happened in Angola.
- Bunyoro Kingdom has put forward interests for a certain percentage accruing to them.
- As journalists we would like to go to the field to have a feel of the project, with the area before the planned project starts.
- What type of wildlife is in the area especially close to sites 1 & 2?
- The smoke which is to be produced is likely to be thick, dark and such smoke has an effect on the wildlife. The smoke could be easily driven off by wind (ie it will be carried into wildlife areas).
- In case of oil spillages, there is likely to be an impact on the aquatic ecosystems.
- The EPS should be located in the windward area with less rain.
- Tullow Oil needs to have a media excursion to address the following issues:
    - What is Tullow doing to avoid environmental damage?
    - Reduce negative perceptions of the people with respect to the Oil Industry.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Nile Basin Discourse Forum (NBDF) Offices, Entebbe
Date of Meeting	Tuesday 17 July 2007
Present	Mr. Melakou Tegnegn – Regional Coordinator- NBDF Ms Beat Mutyaba – Communications Officer Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	17 July 2007

Introduction

The introduction was given by Ms Zöe Day. She introduced herself and the subject of the meeting. In 2002, Hardman made exploration studies in Hoima and discovered oil. Tullow acquired Hardman in 2007.

Since Mr. Melakou Tegnegn had received and read the background information document (BID), Zöe gave a brief introduction of the proposed EPS project. Ms Zöe Day also stated that the EIA process has begun and it is the first part of the entire study which involved stakeholder consultation to solicit their views, opinions and concerns about the proposed project.

A number of alternative sites are being considered for the location of the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1*:* Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

Alternative 2*:* Further East outside the Kabwoya Wildlife area i.e. within the Kaiso Tonya Community Wildlife Area on the opposite side of the Hohwa River.

Alternative 3: Within the Kabwoya Wildlife Reserve but more south of Mputa 2 and 3 close to the base of the escarpment.

Alternative 4: Outside both the Kabwoya Wildlife Reserve and the Kaiso Tonya Community Wildlife Area, to the south-west of the Ngaasa Spit.

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells and injection wells will be connected via flow lines to the central processing facility of the EPS. The oil

has a high wax content and this leads to a high pour point (40^{o}C). In other words if the oil reaches any temperature below 40^{o}C it will solidify. It is thus not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of Naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers.

There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The foot print of the EPS is to include the following facilities:

- Oil and Gas processing
- Pipelines to the EPS
- Transport
- Product Storage
- Temporary and permanent camps.

The amount of water needed for the project is approximately 5,000 barrels of water per day (bpd), to use as injection water to maintain the reservoir pressure. In time the injection water will begin to re-circulate and hence demand for fresh water will drop with time. Sources for this fresh water are being examined such as local aquifers or from the lake.

Production facilities are to be modularised, as far as possible, before transport to site in order to minimise the number of construction hours on site and in order to improve the project schedule. The size of the modules will be dictated by logistical constraints and this will be determined during detailed design following contract award.

The construction period is estimated to take 4 months with a temporary crew size of approximately 140 personnel. This will be comprised of 30 main contractor specialists and 110 local workforce. As discussed above, a camp will be required for this period with rotational leave for the labour force (most likely on a monthly basis). The construction activities will include: site clearance, roads, trucks movement, etc.

The next stage after stake holder consultation will be actual field visits with the various specialists to under take studies. The studies to be carried out will include:

- Hydrology
- Social

- Biodiversity including flora and fauna
- Air quality
- Waste management
- Visual and Noise (proposed at this stage).

Issues raised

During the meeting the issues that were raised were in form of questions, by Mr. Melakou Tegegn and Zöe gave answers as indicated below.

Q: What kind of waste will be generated?
A: The waste is expected to be residual waste from the Oil products. It is anticipated that the waste will be trucked out of the area.

Q: Will there be indirect employment? What is Tullow doing to ensure employment of the locals or how will they benefit indirectly?
A: The employment will happen with time.

Q: Does the immediate community benefit from these projects?
A: This is something that will need to be addressed by Tullow.

Q: In case of eviction, will the community be compensated?
A: There is need to look at the social and environmental costs of the proposed project.

Q: In terms of sustainable development where are we with respect to these projects?
A: Oil production can be hazardous if not well taken care of. With respect to the location of sites, the preservation of the environment is crucial and is not just about tourism.

Another issue is about conflicts – both potential and actual. It has come to our attention that the Ugandan government arrests fishermen from the DRC – Congo. But with specific reference to the Oil resource, what if Congo comes out and claims rights to this oil? The bed from which the oil is to be extracted is the same. There is likelihood for a potential conflict here which needs to be addressed or thought of ahead of time.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Environmental Conservation Trust, Kamwokya (Eco Trust) Offices
Date of Meeting	Tuesday 17 July 2007
Present	Mr. Gerald Kairu – Programme Officer – Eco Trust. Mr. John Morley – Uganda Country Manager– Tullow Ms Kristina Kasibayo – Legal & Compliance – Tullow Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	17 July 2007

Introduction

The meeting kicked off with a brief introduction of the members. After the introduction, a brief introduction about the EPS was given by Zöe.
The project is to be located of the East side of L. Albert. Using a schematic diagram, Zöe went through what the EPS project is all about, briefly describing what facilities it will comprise of.

A number of alternative sites are being considered for the location of the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1*:* Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

Alternative 2*:* Further East outside the Kabwoya Wildlife area i.e. within the Kaiso Tonya Community Wildlife Area on the opposite side of the Hohwa River.

Alternative 3: Within the Kabwoya Wildlife Reserve but more south of Mputa 2 and 3 close to the base of the escarpment.

Alternative 4: Outside both the Kabwoya Wildlife Reserve and the Kaiso Tonya Community Wildlife Area, to the south-west of the Ngaasa Spit.

In the EPS, Tullow Oil seeks to produce 4,000 bpd of oil. The oil will be used to produce four products which will include Diesel, Kerosene, HFO and Naphtha. Some HFO will be used for power generation while the excess is to be loaded on to trucks for export.

With specific reference to the EPS, the construction phase will be modularised as far as possible, before transport to site in order to minimise the number of construction hours on site and in order to improve the project schedule. The size of the modules will be dictated by logistical constraints and this will be determined during detailed design following contract award.

The construction period is estimated to take 4 months with a temporary crew size of approximately 140 personnel. This will be comprised of 30 main contractor specialists and a 110 local workforce. As discussed above, a temporary camp will be required for this period with rotational leave for the labour force (most likely on a monthly basis). The construction activities will include: site clearance, roads, trucks movement, etc.

We are currently involved in stakeholder consultation which will be followed by actual field visits for the various studies to be carried out by respective specialists. It is anticipated that the studies will take between 4 – 6 weeks.

The studies to be carried out will include:

- Hydrology
- Socio- economic
- Biodiversity including flora and fauna
- Air quality
- Waste management
- Visual and Noise (proposed at this stage)

The results of the various studies to be carried out will be incorporated into and Environment Impact report and this will be available to the public for comment.

The purpose of our visit today is to solicit for your views, concerns and comments of the proposed project.

Mr. Gerald Kairu – gave a brief introduction about his organisation Eco Trust. It is an NGO involved in environmental conservation activities. One of the activities they are involved in, include a Carbon absorption project in Bushenyi. Eco Trust purchases carbon permits and is working with international organisations to fund this project. They have carried out studies and know the acreage needed for a specific amount of carbon to be absorbed by trees. They identified farmers in this district and signed agreements with them. For each tonne of carbon, Eco Trust pays a farmer US$10.

Issues raised during the meeting:

This is a project for fossil fuels and therefore it is likely to produce methane gas which is about 20 times more dangerous than carbon dioxide gas. However this does not mean that the project cannot go ahead. The catch here would be a proper EIA to ensure that no stone is left unturned.

Tullow Oil needs to identify the type of tree to plant and their carbon sequestration rate. This will involve the calculation of the amount of carbon dioxide which is sequestrated by the trees. There will also be need to make agreements with the farmers. Eco Trust follows United Nations Forum for Climatic Change guidelines in the operations of this project.

Mr. Kairu suggested that although tree planting is one way of absorbing carbon, other ways should be identified to convert methane to other less toxic gases. The other suggestion was that Tullow should incorporate other activities to cater for carbon absorption for example bio-gas digesters to produce gas for cooking.

There is an issue of sustainability for the trees. There is need to spread tree planting country wide. Some NGOs should be involved e.g. the one headed by Bill Farmer. This could help increase Tullow's advocacy. Advocacy is important because people need to get to know what is being done. To this he added that Tullow should increase its level of Public Relations.

It's also important for Tullow to look at the interests of Bunyoro Kitara Kingdom and those of the local government.

Questions raised

- For the toxic products to be produced, what is to be done? What mitigation measures will be put in place?
- What sort of transport is to be used? What is going to be the impact of accidents of the area?
- What type of compensation will be carried out?
- Tree planting is an option for Carbon absorption but how about other gases?
- How is the Community to benefit from this project?

Reactions from Mr. John Morley - Tullow

Tullow Oil is the first organisation to be carbon neutral. How is this going to be done? The first option is tree planting. There will be studies carried out to determine/ calculate the total emissions in terms of acreage of the trees to be planted. The other option is to have the refinery in total containment. Currently the oil industry is a clean industry and Tullow intends to use latest technology.

The management of the resources is a dual responsibility of Tullow and the Government of Uganda. The tree planting will be carried out on government land.

With respect to Community benefits, Tullow has carried out a lot of activities for the people surrounding their project activities and the benefits include:

- Health services – a maternity unit has been built in Kyehoro village
- Growing food for a school in Kyehoro
- A solar powered water treatment plant for the 4 -5 villages
- All unskilled labour which Tullow uses is from the villages in the area.
- There is also going to be training to 200 Traditional Birth Attendants (TBA).
- A German Doctor – on a 2 year contract – will come and work with USAID and the Ministry of Health – Uganda.
- Tullow is working with National Lake Rescue on a mosquito net project in Kaiso village. This is geared towards mitigating malaria in the area.
- Cooperatives have been set up and the projects being undertaken include honey production.

It is anticipated that the proceeds from Oil will help the government reduce its dependency on donor funds which currently stands at a rate of 51%.

With respect to working with NGOs, Tullow has had a challenge in the sense that most of the NGOs need funds and yet Tullow wants to get the benefits directly to the local people.

Plans are under way for Tullow to transport nine representatives to the valley for a guided tour around the project.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	National Lake Rescue Institute, Kawuku Bunga Offices
Date of Meeting	Wednesday 18 July, 2007
Present	Ms Joanna McDonald – Operations Manager – Lake Rescue Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	18 July 2007

Introduction

Ms Zöe Day gave the introductory remarks. Tullow contracted ERM – Environmental Resources Managers, a global company but with offices in Cape Town, South Africa to carry out the EIA for the Early Production System (EPS). Prior to the EPS was the exploration which ERM have been involved. Tullow has now moved from exploration to the production phase. ERM has partnered with EACL a consultancy here in Uganda as required by law.

A number of alternative sites are being considered for the location of the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1*:* Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

Alternative 2*:* Further East outside the Kabwoya Wildlife area i.e. within the Kaiso Tonya Community Wildlife Area on the opposite side of the Hohwa River.

Alternative 3: Within the Kabwoya Wildlife Reserve but more south of Mputa 2 and 3 close to the base of the escarpment.

Alternative 4: Outside both the Kabwoya Wildlife Reserve and the Kaiso Tonya Community Wildlife Area, to the south-west of the Ngaasa Spit.

We are looking to choose the best two sites which will be undertaken during a site selection process. The most favourable site is Site 1 which is closest to the wells. This makes it cheaper in terms of construction of pipelines however it is of concern due to its location in a wildlife reserve area.

Meeting minutes

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells and injection wells will be connected via flow lines to the central processing facility of the EPS. The oil has a high wax content and this leads to a high pour point (40^{o}C). In other words if the oil reaches any temperature below 40^{o}C it will solidify. It is thus not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for Naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The foot print of the EPS will include the following facilities:-

- The oil and Gas facility
- Access roads
- Product storage
- Power generator and associated utilities
- Temporary and permanent camp

The construction phase will take about 4 months. This process will involve construction of a temporary camp of about 140 people (110 – local and 30 expatriates). The construction will be modularised meaning the equipment will be pre-built and brought into the site by trucks. An engineering company called Genesis in the UK is responsible for putting up the tenders for the construction.

The amount of water needed for the project is approximately 5,000 barrels of water per day (bpd), to use as injection water to maintain the reservoir pressure. In time the injection water will begin to re-circulate and hence demand for fresh water will drop with time. Sources for this fresh water are being examined such as local aquifers or from the lake.

The studies to be carried out will include:

- Hydrology
- Socio- economic
- Biodiversity including flora and fauna
- Air quality
- Waste
- Visual and Noise (proposed at this stage)

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Comments from Joanna McDonald.

Joanna and Tim have an experience in working with the oil industry. They will work with the community in the area to help them prepare for what is likely to come up as the project progresses. They have a project in Kaiso and so they already established contact with the community.

She apologised that she had not been able to devote sufficient time to identify key issues to raise but promised to communicate in the near future since a response sheet had been availed along with the background information document which had been sent before the meeting.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Uganda Wildlife Society, Kamwokya Offices
Date of Meeting	Wednesday 18 July, 2007
Present	Ms Annet Nakyeyune – Executive Secretary UWS Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	18 July 2007

Introduction

In 2002, Hardman made exploration studies in Hoima and discovered oil. Tullow acquired Hardman in 2007. Tullow has appointed ERM, a global environmental consulting firm to undertake an EIA for the Early Production System. ERM is working in partnership with EACL. Currently Tullow has identified 4 alternative sites for the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

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Alternative 4: Outside both the Kabwoya Wildlife Reserve and the Kaiso Tonya Community Wildlife Area, to the south-west of the Ngaasa Spit.

ERM and EACL along with Tullow will develop criteria for assessment but we anticipate selecting 2 sites from which one will be selected.

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells and injection wells will be connected via flow lines to the central processing facility of the EPS. The oil has a high wax content and this leads to a high pour point (40^{o}C). In other words if the oil reaches any temperature below 40^{o}C it will solidify. It is thus not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The foot print of the EPS will include the following facilities:-

- The oil and Gas facility,
- Access roads,
- Product storage,
- Power generator and associated utilities
- Temporary and permanent camps

The construction phase will take about 4 months. This process will involve construction of a temporary camp of about 140 people (110 – local and 30 expatriates). The construction will be modularised meaning the equipment will be pre-built and brought into the site by trucks. An engineering company called Genesis in the UK is responsible for putting up the tenders for the construction.

The amount of water needed for the project is approximately 5,000 barrels of water per day (bpd), to use as injection water to maintain the reservoir pressure. In time the injection water will begin to re-circulate and hence demand for fresh water will drop with time. Sources for this fresh water are being examined such as local aquifers or from the lake.

The first stage in this EIA is stakeholder consultation which is currently being undertaken. The next stage in the EIA process will be carrying out studies which will be carried out will include:

- Hydrology
- Social
- Biodiversity including flora and fauna
- Air quality
- Waste
- Visual and Noise - proposed
- Tourism – potential macro impacts - proposed

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Meeting minutes

Comments and Issues raised by M/s Annet Nakyeyune – Executive Secretary UWS.

The economic viability of the project is good, however with respect to Site 4 – transboundary issues are likely to arise with the DRC – Congo e.g. in case of pollution since Site 4 is in very close to proximity to Lake Albert, a resource shared by both DRC – Congo and Uganda.

Q: What will be the impact of the heating on the environment?
A: The equipment to be used will be in compliance with international standards and thus it is anticipated that this will mitigate the impacts of heat on the environment. The cumulative impacts will be looked at in the study.

Q: Why not carry out a Strategic Environment Assessment – SEA- and come up with concrete information and viable mitigation measures especially with respect to health? Nothing has been mentioned about environmental health!
A: Tullow has undertaken an EIA of the area in the past, however this was not an SEA.

Q: The background information documents suggests about 110 local people will be employed, what kind of employment is being referred to here?
A: The skill base of the local people is limited so we anticipate the employment opportunities will include manual labour.

Q: Won't it be expensive to have and maintain 30 expatriate? Why not use Ugandan labour?
A: To be forwarded to Tullow to be addressed.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Advocates Coalition for Development & Environment (ACODE) - Kamwokya Offices
Date of Meeting	Thursday 19 July, 2007
Present	Mr. Arthur Bainomugisha – Director Research – ACODE Mr. Morrison Rwakakamba – Research Associate – ACODE Ms Kristina Kasibayo – Legal and Compliance – Tullow Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	19 July 2007

Introduction

Tullow appointed ERM to carry out an EIA for an Early Production System in Kaiso Tonya valley. Currently Tullow has identified 4 areas – alternative sites for the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1*:* Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

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ERM and EACL along with Tullow will develop criteria for assessment but we anticipate selecting 2 sites from which one will be selected.

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells and injection wells will be connected via flow lines to the central processing facility of the EPS. The oil has a high wax content and this leads to a high pour point (40^{o}C). In other words if the oil reaches any temperature below 40^{o}C it will solidify. It is thus

not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The foot print of the EPS will include the following facilities:-

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The amount of water needed for the project is approximately 5,000 barrels of water per day (bpd), to use as injection water to maintain the reservoir pressure. In time the injection water will begin to re-circulate and hence demand for fresh water will drop with time. Sources for this fresh water are being examined such as local aquifers or from the lake.

The first stage in this EIA is stakeholder consultation which is currently being undertaken. The next stage in the EIA process will be carrying out studies which will be carried out will include:

- Hydrology
- Social
- Biodiversity including flora and fauna
- Air quality
- Waste
- Visual and Noise - proposed
- Tourism – potential macro impacts - proposed

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Reactions from Mr. Arthur Bainomugisha.

ACODE had carried out preliminary studies on oil. We would like to look at the studies which ERM & EACL are to undertake. ACODE is part of a global project – The Access Initiative (TAI) and also works with World Resources Institute (WRI).

The project vision of TIA is based on Principle 10 of the Rio Declaration. This organisation is set to ensure that governments are in compliance with this principle. The principle requires that people have free access to information. For example in Uganda, the results of compliance were the establishment of NEMA and the NEMA statute – legalises the existence of NEMA as an institution.

Legislation has been produced by government to ensure free access to information so that people can go to developers, organisations, etc to source for information. A case in sight is The Constitution of Uganda Article 45 which empowers the citizens to have free access to information.

TIA was improved at the 2002 World Summit in Johannesburg, South Africa. The PP10 was launched and it stands for Partnership to Principle 10. This is an advanced TIA where governments have increased commitment to compliance to Principle 10.

The Petroleum Exploration Act (PEA) needs to compel government to "Publish What You Earn". This encourages transparency and avoids secrecy so that people don't cash in in secrecy. He recommends the amendment of the PEA to include transparency and accountability. There was an over sight of oil by the government in this Act ad so it should be taken back to the Parliament instead of being presided over by the Executive. ACODE will be engaging Parliament on this.

Issues raised by Mr. Arthur Bainomugisha and Mr. Morrison Rwakakamba:

- Biodiversity - Sites 1 & 3 are located in a conservation area. What will be the impact of extraction on the reserve? Consider the case of Alaska, US. How is the extraction going to be done without impacting on the environment?
- Benefit sharing Mechanism (BSM) should be established and it must be transparent to all (ie local people, local government and the central government). The BSM worked in Botswana with respect to diamonds. The BSM would help turn around the curse associated with the oil

resource. The BSM establishes who earns what and what percentage goes to whom.

- The Production Sharing Agreement between Government and Tullow should be made public.
- Role of cultural institutions – Bunyoro Kitara Kingdom has a moral cultural mandate of the community.
- Socioeconomic study – this must be detailed to ensure that there is peaceful exploitation of the resource. It is true that Tullow has given out benefits but they are not institutionalised, meaning that no agreement was signed or arrived at between Tullow and the Community. The benefits should be given through an agreement so that sustainability is ensured. This brings about the issue of commitment.
- The BID talks about 30 expatriates. They should work along side Ugandans in order to pass on the skills which they have.
- How will the resource be passed on? There is need to find out how much oil there is. How long it will last and the plan to use it so that we can continue and other sectors continue as well. This is because oil has a tendency to kill other sectors e.g. in Gabon the agricultural sector died because people depended on oil alone. Now all of a sudden the oil is no more and since food used to be imported from France and South Africa people can no longer afford to feed themselves. The funds from the oil sector have dwindled greatly making the importation of food almost impossible.

Meeting minutes

Reactions from Mr. Morrison Rwakakamba

.

There is need for the EIA team for this project to keep in touch with ACODE whilst carrying out their studies. This is so that ACODE can back stop these studies. He suggested synergism.

ACODE is set to carry out independent studies as an organisation to ensure their legitimacy.

Reactions from Kristina Kasibayo:

- Petrol will be produced in the long run. Currently the EPS is set to have a mini refinery but later on with more oil; Tullow will produce Petrol with a bigger refinery.

- The expatriates will have a period of 6 – 9 months in which to train the nationals and leave.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	CMI Offices
Date of Meeting	Thursday 19 July, 2007.
Present	Captain Deus Nyakenda David Tinka – Officer in Charge of Explosives – CMI Hqrs. Ms Kristina Kasibayo – Legal and Compliance Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	19 July 2007

Introduction

Tullow appointed ERM to carry out an EIA for an Early Production System in Kaiso Tonya valley. ERM is working in collaboration with EACL a Ugandan environmental consultancy. As per Ugandan Law, when a developer is carrying out EIA they need to consult with stakeholders in their respective categories

Currently Tullow has identified 4 areas – alternative sites for the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

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ERM and EACL along with Tullow will develop criteria for assessment but we anticipate selecting 2 sites from which one will be selected.

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The first stage in this EIA is stakeholder consultation which is currently being undertaken. The next stage in the EIA process will be carrying out studies which will be carried out will include:

- Hydrology
- Social
- Visual– proposed.
- Noise – proposed. It's been a quiet area but with all this activity there is likely to be noise in the area. There is therefore a need to carry out a baseline study and on going monitoring.
- Biodiversity including flora and fauna

- Air quality – find out the air quality before Tullow starts its activities.
- Waste
- Tourism – potential macro impacts – proposed – looking at the likely loss of wildlife and revenue.

It is anticipated that the studies will be under taken starting the first week of August. We will also have consultative meetings with the local community to solicit their views, opinions and concerns.

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Reactions from Zöe

For this project we are looking at European Commission for air quality. The waste study, will to be a desk study which will look at potential waste streams including liquid waste, heavy contaminant wastes, domestic waste from the camps, among others. The study will recommend appropriate disposal mechanisms for the various types of wastes.

With respect to the Social study, we have realised that the Community is heavily reliant on fish. Other components of the study will include impacts on the customs, impact of the expatriates on the community, immigration of people from other areas in search for employment, etc.

Comments from Capt. Deus Nyakenda and David Tinka.

The government of Uganda welcome this project because of the potential benefits that are to be accrued from it. However, they are also keen to ensure that the project is undertaken in the cleanest way possible.

The government carries out activities like monitoring, socio-economic, political and scientific. They have work with several companies in the area including Neptune, Heritage and are also willing to continue working with Tullow to ensure that project activities run smoothly.

Issues raised and Recommendations made

- There is need to diversify employment in terms of ethnic composition. It has been discovered that the Bagungu are a composition of Alur and Banyoro. There is need for the employers to be keen in this area. The government is looking at a workforce which are capable and not sub-standard. Government is monitoring all activities with respect to the oil resource.
- This project is a security concern and government would like to avoid infiltration of "wrong" people into the area. There is need to have a vetting

system. For example if the recruiting organisations have a database of the potential employees, then the CMI can scan through the database and be able to identify questionable characters.

- How does Tullow plan to source the 110 local people?
- The government is ready and willing to provide any information and or data for region once specific requests are made.

Responses from Kristina Kasibayo – Tullow

Tullow plans to use the LC1 Chairpersons of the villages in the area. This system has been used in some of the on going projects which Tullow is operating in the area. In addition to this, Tullow is set to ask the Local Authorities to set up an office and a database for potential employees. Tullow will facilitate the setting up of this office. So any time Tullow needs to recruit, the office will be able to provide the required work force.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	WWF Office, Bukoto Street, Kampala
Date of Meeting	Friday 20 July, 2007
Present	Mr. David Duli – Country Coordinator – WWF Uganda Projects Office. Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	20 July 2007

Introduction

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Comments from the Country Coordinator WWF – Mr. David Duli

WWF is currently running a fresh water project. The objective of the project is to manage fresh water resources in R.Wambabya, Waki and Nkusi catchments. There is need to map the stakeholders using these resources and work out a system for usage, sharing and management of these resources. The fresh water project has a budget of US $ 1.3 million and it is anticipated to last for 3 years.

WWF are also about to commence a forestry project called the Albertine Rift Forest Conservation Project in Masindi, Buliisa, Kibale, Hoima, Kyenjojo with funding from the GEF fund. The project aims at strengthening management of central forest reserves while working with NFA. The other objectives of this project include:

- Strengthening the management of local forest reserves and forests on private land;
- Supporting livelihood, security intervention for communities living round these forests; and
- Trying to create a wildlife corridor amongst the different forest blocks.

The Forestry project has a budget of US $ 3.3 million and is expected to last 5 years. Therefore for any project which is to be carried out in the Forestry reserve we need to interface.

Uganda Wildlife Authority and PEPD need to open up to civil society organisations to come into picture and take part in the management of these resources.

With specific reference to the EPS, every body is excited about the project. The challenge is that people do not know what oil exploration is all about. If the company can invest in awareness it would help so that people can understand what the oil production will bring to the local and wider areas. Developers ought to engage with the local civil society organisations to reach the communities in order to create a wider awareness. These include: civil society organisations, politicians, CBOs, NEMA, District Environment Officers, NGOs could be engaged with by oil companies in order to disseminate information.

There is need to simplify the science associated with the EPS so that a lay person can be able to understand. The impacts of the project must also be discussed.

There is a need to talk to Mr. Bruce Martins because he has a wealth of experience and is well respected in the community.

There is a need to invest in schools and resource centres.

Meeting minutes

Issues raised

- How will the EPS affect the fishing communities; specifically their livelihoods and businesses?
- Mitigation measures should be identified clearly for the likely impacts on the wildlife, ecosystems and the people.
- The water resources feed into Lake Albert. This therefore calls for responsible behaviour in the activities to be carried out particularly with specific reference to water usage.
- There are other impacts associated with the EPS activities on the environment in the area e.g. socio-economic impacts. There is need to investigate and find out the potential impacts and their mitigation measures.
- The managers of wildlife need to work with WWF to identify the mitigation measures.
- There is need to work with the Water Resources Management Department in Entebbe.
- There is going to be heavy movement of vehicles and this will have an impact on the wildlife.

Reactions from Mr. Morrison Rwakakamba

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There is need for the EIA team for this project to keep in touch with ACODE whilst carrying out their studies. This is so that ACODE can back stop these studies. He suggested synergism.

ACODE is set to carry out independent studies as an organisation to ensure their legitimacy.

Reactions from Kristina Kasibayo:

- Petrol will be produced in the long run. Currently the EPS is set to have a mini refinery but later on with more oil; Tullow will produce Petrol with a bigger refinery.

- The expatriates will have a period of 6 – 9 months in which to train the nationals and leave.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Uganda Wildlife Authority Offices - Kampala
Date of Meeting	Friday 20 July, 2007.
Present	Ms Eunice Nyiramahoro - Director Tourism Business Development & Planning Ms Justine Namara – Senior Planning & EIA Officer UWA Ms Kristina Kasibayo – Legal and Compliance – Tullow Oil Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	20 July 2007

Introduction

Tullow appointed ERM to carry out an EIA for an Early Production System in Kaiso Tonya valley. ERM is working in collaboration with EACL a Ugandan environmental consultancy. As per Ugandan Law, when a developer is carrying out EIA they need to consult with stakeholders in their respective categories

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- Waste
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It is anticipated that the studies will be under taken starting the first week of August. We will also have consultative meetings with the local community to solicit their views, opinions and concerns.

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Comments from Ms Eunice Nyiramahoro - Director Tourism & Development

- When carrying out the specialist studies a study on the impact of tourism should be undertaken because the area has exisiting tourism activities.

- In order to comment on the tabled alternatives there is need to have the pros and cons for each alternative site clearly highlighted. Otherwise it is not possible at this stage to comment or select one site just by looking at their location on a map. Many aspects need to be considered in site selection including that Tullow Oil has a ceiling as to how much they are able to invest in the establishment of the EPS.

- The criteria for selection should have been indicated against each of the alternative sites to be able to select the most appropriate site.

- Alternative Site 1. In terms of environment impacts – what is being considered since this site in located in a wildlife reserve. Before the oil resource was discovered, a lot of investment was made to restore the land in order to have the area as a reserve to preserve the flora and fauna. This reserve is being properly managed as a tourist destination between UWA and the District Officials. UWA went into a contract with Mr. Bruce Martins for 20 years which is government commitment. In looking for a site one needs to have one that will allow co-existence with tourism. Some sites might be too expensive but more considerations should be made. It is now Tullow's responsibility to ensure that all the environmental issues are catered for.

- As UWA, we need a site with the best balance between oil exploration and maintaining the wildlife reserve.

- Looking at the visual impacts with respect to each site, the issue could be that the facility is within or outside the reserve but with poor visual effects. The best would be the location of the facility outside the reserve and outside of sight for tourism.

- With the quality of the oil – considering the fact that it has a high pour point- it's sensible to locate the EPS closer to the lake. But with respect to site 4 there is a risk of pollution of the lake which makes it very sensitive.

- There is need to consider the related infrastructure, for example, what will be the impact of the roads on the reserve. Preference would be for fewer roads running through the reserve.

- If the EPS facility were on top of the escarpment then the camp would be closer to the community and this would be of benefit to the community. The camp would have certain facilities or needs which could be of direct benefit to the community.

- Permanent accommodation, this facility should be located out of the reserve so that it can benefit the Kaiso-Tonya community and the workforce.

- In the case of water for the production system, this might require to site the facility close to an aquifer.

- In terms of setting up the power plant, the further away from the National Grid the higher (in terms of number) lines would be constructed. These lines would also have an impact on the area. The preference would be for as few lines as possible.

- There is need for a site plan to be provided, showing how the different facilities are going to be sited so then the impacts can be easily identified.

Comments from Ms Justine Namara - EIA Officer

- The Project brief indicates that the EPS should be located away from the sensitive area, as one of the mitigation measures with respect to site location, it states that no site should be located in the conservation areas. This implies that the site for location of the EPS has been selected. This should be revised.

- The project is going to produce heavy contaminated wastes. There is therefore a need for a competent authority to approve sites for waste disposal. It is critical that under estimation of the wastes to be produced is avoided.

Comments from Ms Zöe Day – ERM

- Sensitivity mapping will be undertaken in order to undertake a site screening assessment. Two sites will then be taken forward during the EIA.

Comments from Ms Kristina Kasibayo – Tullow

- The escarpment road is being widened and cemented to improve of the transportation network from the valley to Hoima.

- Tullow plans to use a tendering system and the company which wins the tender will collect the oil from a collection point then make the deliveries on their own. Tullow will not deal with delivery and distribution. This will be for a period of time until another tender is advertised.

- Drilling of more wells is still going on after which a bigger refinery will be constructed. At the moment the refinery will be a mini – refinery.

- Initially the HFO was thought to be used for heating but 2 weeks ago gas was discovered so it (the gas) will be sold off to companies here like Tororo Cement Industry instead of them purchasing the gas from Mombasa.

Issues raised

Issues raised by both the Director and the EIA Officer include the following:

- In terms of the temporary camp why not use the camp at Nziizi for the construction workers to avoid clearing another are for camp construction?
- With respect to site selection, what is the size of the facilities? How much land is to be used in terms of acreage?
- How are the pipes to be laid? Is it going to be surface or under ground work? Surface pipes will have an impact on the animals. There is also a visual impact and the danger of the oil being tapped which is a danger to the reserve if the pipes are laid on the surface.
- There is need to have a thorough look through the impacts suggested. The Project brief indicates that the operation phase will operate 24 hours 7 days a week but suggests that as one of mitigation measures the operation will avoid the sensitive time of the year. Then how does the developer plan to avoid the sensitive time of the year with respect to wildlife. There is need to come up with specific mitigation measures for specific impacts.
- With respect to transportation – tankers and tracks are to be used as a means of transport. Would the facility have a parking bay / collection / dispatch points. Would this be part of the EPS or a different facility altogether?
- Would the discovered gas be used locally – by the community or in the EPS? Wouldn't it be good to have the gas for the locals? This issue has to be revisited and explained fully. If the gas can be used locally then it's cheaper, the power is likely to be more expensive to the local people and therefore not useful.
- Some of the power being for the EPS could also be shared with the community by use of step down transformers / generators.

- Tullow should undertake sensitisation and awareness campaigns to raise awareness of the EPS and its potential impacts.
- The expectations of the community are very high.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Environment Alert Offices – Kabalagala
Date of Meeting	Friday 20 July, 2007
Present	Mrs. Dorothy Kaggwa – Senior Programme Officer, Environment Alert Ms Kristina Kasibayo – Legal and Compliance – Tullow Oil Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	20 July 2007

Introduction

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Comments from Mrs. Dorothy Kaggwa – Senior Programme Officer

Environment Alert is a Non Governmental development Organisation born out of the need to address the alarmingly low levels of agricultural productivity in the country, high levels of food insecurity and low incomes in both rural and urban poor communities, in addition to protecting against rapid degradation of natural resources o which community livelihood depends.

Environment Alert is involved in Community Empowerment facilitates civic education and has been part of task forces in policy formulation. This NGO is also involved in policy research, analysis, and monitoring. Other areas of operation include food security, natural resources management, Land, Land use and Soils, and forestry.

EA works in the districts of Wakiso, Sironko, Mubende and the West Nile Region. It also strives to develop and maintain links with local, national and international partners and institutions in order to realise its objectives.

Issues raised

The following issues were raised:

- How much HFO is to be used for power generation?
- Not much has been mentioned in terms of pollution with respect to water and air. There is need to look at the water quality. For the water which is to be returned to the aquifers, there is need to see the point at which the water gets back to the source(lake or aquifer) in terms of quality.
- Spillages in case of accidents. Which study caters for this? When there are oil spills, fire safety should be ensured especially for the biodiversity.
- Social benefits – what is the cost of this project in terms of what the community has to lose, for example loss of access to certain resources, etc?
- There is need to diversify the consultation process through the papers, website and other forms of media.

Further comments will be sent by email.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Uganda Nile Basin Discourse Forum, Hotel Equatoria - Kampala
Date of Meeting	Monday 23 July, 2007
Present	Ms Sarah Naigaga – Country Coordinator, Uganda Nile Basin Discourse Forum Ms Zöe Day – ERM Ms Sheila Namuwaya - EACL
Distribution	
Date	23 July 2007

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The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Comments from Ms. Sarah Naigaga

Lake Albert is a transboundary resource so the catchment cannot be defined on the Ugandan side only. The bed from which the oil is to be drawn is shared amongst three countries – Uganda, DRC Congo and Sudan. There might be a need to consider the International Principles with respect to the Albertine Rift. Sudan might come up strongly to oppose this venture since they also have interests in the oil resource. Studies need to be carried out on how oil extraction will impact on the discoveries made by Sudan.

The production of oil is a good but dangerous venture. Dangerous in the sense that it has potential for conflicts within the country borders and outside her borders.

A monitoring system should be put in place for the sale of the by – products and how the community benefits. How will the companies that would have won the tender handle the products via discharge and distribution? There have been cases when companies which take by –products from producers situate themselves near the producer and connect their disposal pipes to the main water bodies but well disguised. In the long run, the developer (producer) is thought to be polluting the aquifers and water sources which is not the case. There is therefore need for Tullow to guard against this.

The Nile Basin Discourse Forum – Ugandan Chapter is a resource centre for NEMA. In case the EIA report or any other document needs public view and comments can be put at their offices for people to read. They would be more than willing to provide the services.

Issues raised

- Does Tullow own the land where the EPS is located?
- What communities will be impacted?
- Have the experts been identified for the studies to be carried out in this EIA? If so, have they been approved by NEMA?
- Has NEMA seen and approved the TORs?
- There are threatened species in the area and so studies ought to identify them and ensure that the appropriate mitigation measures are designed for their safety.
- We would like to know how much land has been secured by Tullow for the EPS and from whom. For example for the sites that are proposed in the reserve, has the land been acquired?
- Only one design for the EPS has been shown – why choose this design? Are there other designs?

- Is everything which is to be used for the construction of the EPS going to be metallic? The BID talks about modularisation but there are likely to be other material needed for the construction of the EPS. Which raw materials will be used, what will be the site of acquisition? Is this site within the secured land for the EPS?
- In terms of the waste to be generated – what is the capacity of the facility at which the waste is to be disposed of? What time would it take for this facility to get to its maximum level?
- The social benefits at the various levels – local, national and regional should be explained.
- The BID describes the production system and mentions desalting. This is not clear and so more light should be thrown on it.
- There is also need to explain how the power plant will be connected to the national grid. This is of particular interest because Uganda has a power crisis but instead the documents provided seem to explain the regional benefits in terms of power more than the national benefits.
- Tullow should put in place an audit system where it monitors how their suppliers carry out their activities, if licenses are current, and their capacities. This would help Tullow to safe guard against those suppliers not in compliance of the law.
- The BID mentions export with respect to the HFO. What was meant by the term export? Is this HFO going to markets outside the Ugandan border? The HFO should be able to benefit the communities socially and economically.
- The Ministry of Energy needs to come out in the open and make comments on its view about the proposed EPS project. This could be in reference to power generation without dam construction and use of irrigation instead.
- Some losses will be inevitable but how do we compensate them? For example road construction will need vegetation clearing. We would like something more tangible than just tree planting. With tree planting land will be required, has it been acquired? What else can be done apart from tree planting?

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	**Environmental Impact Assessment Study for an Early Production System (EPS) for Kaiso Tonya Area, Exploration Area 2, Republic of Uganda**
Venue	Hoima District Offices
Date of Meeting	Tuesday 14th August 2007
Present	Mr. Walter Iriama – CAO Hoima District Sectoral Heads M/s Nahya Nkinzi – CSR Manager, Tullow Ms Sheila Namuwaya - EACL
Distribution	
Date	14 August 2007

Introduction

Tullow appointed ERM to carry out an EIA for an Early Production System in Kaiso Tonya valley. ERM is working in collaboration with EACL a Ugandan environmental consultancy. As per Ugandan Law, when a developer is carrying out EIA they need to consult with stakeholders in their respective categories

Currently Tullow has identified 5 areas – alternative sites for the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1*:* Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

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Alternative 5: This site has recently been added. It is located on the escarpment.

ERM and EACL along with Tullow will develop criteria for assessment but we anticipate selecting 2 sites from which one will be selected.

Meeting minutes

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells and injection wells will be connected via flow lines to the central processing facility of the EPS. The oil has a high wax content and this leads to a high pour point (40^oC). In other words if the oil reaches any temperature below 40^oC it will solidify. It is thus not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The foot print of the EPS will include the following facilities:-

- The oil and Gas facility,
- Access roads,
- Product storage,
- Power generator and associated utilities
- Temporary and permanent camps

The construction phase will take about 4 months. This process will involve construction of a temporary camp of about 140 people (110 – local and 30 expatriates). The construction will be modularised meaning the equipment will be pre-built and brought into the site by trucks. An engineering company called Genesis in the UK is responsible for putting up the tenders for the construction.

The amount of water needed for the project is approximately 5,000 barrels of water per day (bpd), to use as injection water to maintain the reservoir pressure. In time the injection water will begin to re-circulate and hence demand for fresh water will drop with time. Sources for this fresh water are being examined such as local aquifers or from the lake.

The first stage in this EIA is stakeholder consultation which is currently being undertaken. The next stage in the EIA process will be carrying out studies which will be carried out will include:

- Hydrology
- Social
- Visual– proposed.

- Noise – proposed. It's been a quiet area but with all this activity there is likely to be noise in the area. There is therefore a need to carry out a baseline study and on going monitoring.
- Biodiversity including flora and fauna
- Air quality – find out the air quality before Tullow starts its activities.
- Waste
- Tourism – potential macro impacts – proposed – looking at the likely loss of wildlife and revenue.

It is anticipated that the studies will be under taken starting the first week of August. We will also have consultative meetings with the local community to solicit their views, opinions and concerns.

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Issues, Observations and Concerns raised:

- What will be the impact of this project on the economy?
- With respect to waste disposal – how will the waste oil be disposed of?
    - Are the lakes not threatened?
    - What will happen in the event that there are oil spillages?
    - Is there going to be a study considering chemical residuals?
- This project will cause pollution which will have an impact on the wildlife and human beings.
- It is feared that there will be displacement of people at the onset of the EPS activities. Incase there is displacement, will consideration be given to compensation of the affected communities? Are the people at the landing sites likely to be displaced? The villages which are located above the escarpment – people are afraid of being displaced. If they are displaced, are there any strategies for the provision of alternative livelihoods for these people?
- How does the society benefit from this project? Little is given in terms of what is being generated from the production and sale of oil products. So what measures will be put in place to ensure that the local communities and the nation at large benefit from the revenue collected from the early production system?
- Too much pressure has already been put on the existing roads. That is roads from the valley and then the roads from Hoima to the destination markets. Some new roads need to be constructed with proper drainage systems.
- What are the plans for the water supply at the production plant for the 140 people and the permanent staff?
- With respect to schools and other facilities – does Tullow have any plans to put up any more?

- Will the production of fish increase or decrease?
- Can the District be involved in the studies that are to be carried out?
- The District is interested in monitoring the activities that go on in the valley but are constrained in terms of vehicles and fuel. Can they be facilitated with the provision of 2 cars?
- An observation has been made: - the cost of production in Hoima has increased since the discovery of oil.
- The land in Bunyoro (of which Hoima is part) has neither boundaries nor surveyor's marks. Thus the land map for this region is blank. There is likelihood for conflicts because so many people are applying for land. Lake Rescue is among those organisations claiming land but how can conflicts be avoided?
- The fishing communities are concerned about the lagoon since it's the spawning area for Lake Albert.
- Exploration is taking place in the Kabwoya Wildlife Reserve. This was an area where controlled hunting was allowed a few years ago but it was changed to a Reserve. Now the animals have disappeared because the land has been taken. With the onset of the production activities, won't the wildlife be stressed?
    - The herdsmen are on one side of the fence
    - On the other side Tullow Oil Uganda Operations Pty is carrying out their exploration activities.
- The oil (during flaring) is polluting the air.
- There is need to visit areas where refineries have been built to look at the impacts of the refineries on the areas and their environment. This is because these refineries give off an "oil smell" which is heavy.
- The EPS has a requirement for Natural Resources like water, land, etc. What plan does Tullow have for this region to protect the natural resources that the company will use?
- Reliance on Natural Resources places a responsibility on Tullow to manage the resources sustainably.
- The Wambabia River flows into Lake Albert. What measures are in place to manage its catchment areas? What interventions have been put in place with respect to the natural resources?
- Level of involvement of stakeholders – the Local Government has existing structures from the District, to the Sub County and the Communities (villages). This procedure should be followed. Dealing with communities directly is positive but when it comes to structure there is a problem. In case along the way the intervention is not widely accepted or is taken advantage of, the company involved will then need help from both the Sub County and the District at large. But since they were not involved from the very beginning then provision of help or advice becomes a problem.
- The District, at the helm of the Local Government (LOG), has policies in place with specific designs for the following:
    - Health Centres

  - Classrooms / Schools
  - Staffing of these facilities and many others.
- There is need to link up between interventions and LOG. Need to broaden our (Tullow Oil Operations Uganda and Hoima District) linkage. Some of the CSR issues should be discussed at the District level. For example the 2 Maternity units need to be staffed. At the moment government can not afford to pay any health workers but this can be discussed by Tullow and the District Health Officer.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Kaiso
Date of Meeting	Wednesday 15th August, 2007.
Present	M/s Nahya Nkinzi – CSR Manager, Tullow M/s Ashleigh Olsen – Tullow M/s Jean Molloy – CSR Student , Tullow Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
Date	15 August 2007

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It is anticipated that the studies will be under taken starting the first week of August. We will also have consultative meetings with the local community to solicit their views, opinions and concerns.

The results from the studies will be incorporated into an Environment Impact report which will be available to the public. It is anticipated that the report will be completed by October, 2007.

Issues, Observations and Concerns raised:
In as much as the people in the area are looking forward to the development that is anticipated to come along with the construction of the EPS, there are concerns about the negative impacts that are likely to occur as a result of the project.

Throughout all the phases ranging from construction up to the operational stage of EPS, a number of environmental and socio-economic effects will be observed including pollution (which will have a significant effect on biodiversity), vegetation destruction and habitat loss, water resources issues, and increases in traffic and population density and the associated burden on infrastructure like roads, health facilities. Furthermore, restrictions on wildlife movement, diseases related to gas and land use conflicts pose significant challenges. Combined, these also represent risks to the local population, especially in the vicinity of the production site in the Kaiso – Tonya Area.

Having seen that all the above are possible risks which need investigation the community came up with the following views or concerns: (In some cases, some solutions were suggested as indicated below).

1. Vegetation:

- Vegetation is believed to provide for both animals and human beings in terms of food, building materials and firewood. It is therefore the fear of the community that during construction phase, vegetation is going to be cleared and this will adversely affect the animals especially with respect to grass. Human beings will also be adversely affected because trees and grass have and still are a source of building materials as well as fuel for drying the fish from which they earn an income.

Solutions:
Other modes of building materials should be identifies and provided at a subsidised cost to all the people in the area who are affected by the

construction of the EPS. For example metallic and plastic building materials, iron sheets, etc.

Also it is of concern to the community that since they (the community) have been dependant on wood as a source of fuel, this could affect the drying of fish in the area and the domestic use of wood. Since the oil products are likely to produce electric power, could the project developers think of connecting the area to the power grid so that they too could benefit from the electricity to be generated. The other request is for the people to be educated and made aware of the advantages of electric power as opposed to the use of firewood. But also consider providing power to the beneficiaries at a subsidised cost.

2. Water Resources:

The community in the valley have been dependent on water for use and for economic purposes but it is thought that with the establishment of the EPS, contamination of waters by either the emitted gas or discharges shall pollute the water and affect fish populations in the lake. The water shall not therefore be recommended for use by both animals and human beings due to the likely risks which may arise.

Solutions:
In case of water pollution the project should plan to install a water purification system to clean the water. This will ensure that the water is safe for consumption by both human beings and their animals.

The community also feels that Tullow help by ensuring that the purified water is distributed by means of pipes. The drilling of boreholes in the areas would also be of great use to the community.

3. Reduction of fish in the lake due to water contamination.

As a result of potentially contaminated water discharge into the lake, it is believed that the fish shall die and this will negatively impact on the local economy which relies heavily of sustainable fish stocks. If the fish stocks are depleted by pollution, alternative means of living should be provided.

Solutions:
The project should consider obtaining labour from the area so that the people who would have lost their livelihoods from fishing would be gainfully employed in the EPS.

The project should ensure that all its employees are paid salaries commensurate with International Standards with respect to the oil industry elsewhere in the world.

It is the view of the community that in case the local fish economy collapses as a result of the establishment of the EPS in the area, Tullow or the government should plan to relocate the affected population to an appropriate, alternative location elsewhere within Uganda. The new location should be well planned and include basic necessities such as roads, power, water system, sewage systems, security and proper housing facilities.

It is feared that the EPS project will have a long lasting effect and therefore the feeling of the people is that the affected people should be given a living wage for 30 years in addition to proper relocation. The payment should be made directly to the persons affected.

4. Other Socio-economic concerns:

In all production phases up to the final stage, the population in the area will increase. This will affect the standards of living for the people of the area e.g. over stretching on local infrastructure like health facilities, schools, roads, etc.

Solutions:
Due to increased disturbance on transport and traffic volume, the project should have a plan to work on the roads around by making it 1st class tarmac and the roads must be spacious enough.

Tullow should have a plan of building more schools in the area at all levels:- primary, secondary, colleges, etc, with emphasising on science to encourage children to become engineers and scientists.

Tullow should plan to have health facilities with high standards in the area to cater for disease associated with gas production like cancer, vision impairment, etc.

5. Other issues and questions raised:

- Kyehoro has benefited a lot from the services offered by Tullow and yet other surrounding villages seem to be left out.
- Has the government and UWA allowed Tullow to operate within the reserve? This is an important issue since some of the proposed sites for the EPS are located within the game reserve. So what happens to the reserve?
- The site outside the reserve is the best option. This is because location of the EPS in the reserve will place the game at risk. Not only will the increased volume of traffic chase away the wildlife because of the noise but also put them in danger: some game might be run over by trucks.
- With the onset of the operation of the EPS, there will be too much noise, too much light and this will endanger the wildlife.
- In addition to the above, since the proposed locations of the EPS are close to the L. Albert which feeds into the R. Nile (source of water for the Egyptians), the Egyptians will raise their voices because the proposed activities might reduce the amount of water received by Egypt.
- The EPS will attract a lot of security concerns because a lot of people with come into the area. For example the UPDF army is already deployed in the valley and their wives and children are bound to join them. This will increase the pressure on the resources in the valley.
- The EPS should be located on the escarpment because it presents fewer security risks. Road wise it's cheaper to run the EPS related activities

once it's established above the escarpment. There are 2 routes to Hoima beyond the escarpment.

- Operation of the EPS will result in noise production. There is need to confirm the standard noise levels established by NEMA as the authority in charge of maintaining such standards in Uganda. International regulations should not only be consulted but followed as well.
- When Tullow was about to begin their operations, they started with Kyehoro camp. The community in the area was informed that this camp were to be a temporary camp. Not only did Tullow maintain the camp but also constructed other camps in the reserve. It is now being said that there will be a temporary camp for the construction phase of the EPS. The question here is how temporary is "temporary"? Kyehoro camp was temporary but it has turned out be to a permanent camp!
- There is need for the specialists to visit a number of refineries to be able to carry out the necessary studies from an informed point of view.
- How big will the EPS be/ how much land will be required for this project?
- There is need to train drivers (those who will be driving the trucks for the products) to observe and maintain the speed limits.
- The roads are in bad shape (most especially those on the escarpment towards Hoima), what plans does Tullow have?
- Will there be an impact on the fish as a result of the onset of the EPS activities?
- Will there be displacement of people when the EPS starts? What will be the effect on the settlement in the area surrounding the EPS site?
- Does Tullow have a Resettlement Action Plan?
- Will the Desalting of the oil affect the water and the fish in it?
- The Lake resources might be affected because it's anticipated to be the main source of water for the EPS and yet the main source of livelihood for the communities in the valley.
- Doesn't the oil have dangerous gasses?
- What assurance do we have that oil spillages will not occur? In the event that there happens to be an oil Spillage, what plans does Tullow have to clean up the area of all the oil that would have been spilled?
- Won't the emissions from the Topping Unit affect the people, most especially in terms of air pollution?
- Won't the EPS activities affect the herdsmen in the area?
- Can the indigenous people have an opportunity to buy shares in Tullow Oil Uganda Operations Pty?
- There is lack of safe drinking water. Can Tullow provide safe drinking water for the communities the various villages?
- There is need for a maternity centre, can Tullow come in to help with its construction.
- Kaiso Primary School is crowded and there is need for a larger building.
- Will the communities benefit from the electricity to be generated by the EPS?
- The people feel left out in terms of employment. Could they be considered for employment during the construction and operation of

the EPS? Will any body from the communities in the area be considered among the 110 locals that are to be employed?

- With the EPS will there be drilling of more/new wells or the will the EPS use oil from the existing wells.
- Where is the EPS going to be located?
- What criteria will be used for site selection for the EPS?
- Before the onset of the oil activities in the valley, there were fewer earth quakes and tremors but they seem to have increased no. How sure are we that the occurrence of these events will not increase?
- It is feared that as a result of the air pollution from the EPS, women will give birth to deformed children. In the event that this happens who will be responsible for this?
- In case the pipes carrying the oil or its products burst and people's property is destroyed because of fires resulting from such accidents, what emergency plan does Tullow have in mind? Will the affected people be compensated?
- How will people realise benefits from the profits that will be generated from the sale of the oil products from the EPS? Will the communities in the area and the Ugandans at large laugh like the Libyans or cry like the Nigerians?
- It has been noted with concern that in several countries (e.g. Nigeria) where oil has been discovered and being refined, there have arisen a lot of conflicts. Won't there be conflicts in the valley and the surrounding areas with respect to the oil and the EPS?
- Conflicts with other countries seem to be cropping up. What criteria have been put in place to solve these issues? There is need to avoid cross border conflicts for example the case which involved the killing of the British Geologist and other Ugandans in the fire exchange between the Congolese and the Ugandan soldiers.
- The communities in the valley have benefited more than the communities on the escarpment and beyond. For example Kyehoro got a classroom block, a borehole, a maternity unit, other schools got teaching aids for their children, etc but none of the schools above the escarpment have benefited as yet. What plans are being made to ensure that the communities above the escarpment do benefit as well?
- Where will the power lines for the electricity generated from the EPS pass?
- Will the communities benefit from the power to be generated?
- The oil has been discovered in Hoima district. Will the District, Bunyoro Kingdom, the Sub Counties, receive any revenue and how much will each get?
- If the negative Impacts on the Environment out weigh the positive impacts will the EPS be stopped?
- Most of the communities have Traditional Birth Attendants (TBAs) who assist the pregnant women during delivery but they have poor facilities. Will Tullow assist these TBAs with training and other basic facilities to improve their services to the women?
- Can Tullow organise a day for the communities to visit the various sites (and wells) to know what exactly is going on?
- The local farmers have land but they do have a problem with tilling equipment. Can Tullow be of some assistance?

- There has been an increase of the number of orphans as a result from people dying from the AIDS scourge. Is there any way Tullow can be of assistance to these orphans (most especially those of school going age) since the communities are not financially stable to support them through school?
- It is feared that Tullow will chase away all the people within a radius of 10 square miles from their operations. Is this true and if so what are the resettlement plans for these people to be affected by these plans?
- Will Tullow provide market for their products? Most especially for the farming communities above the escarpment? For example by buying their produce?

Expectations:

- The people have a belief that the EPS will bring development to the area.
- The community expects to be employed.
- Safe drinking water
- Construction of schools, health facilities (including Maternity units and labour wards) and improvement in the existing road structures.
- Tullow to conduct seminars on environment and how it will be impacted by the oil activities.
- Help with income generating projects/activities like Bee Keeping, Tree Planting, etc.

Meeting minutes

Environmental Resources Management

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Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Sebagoro
Date of Meeting	Thursday 16th August, 2007.
Present	M/s Nahya Nkinzi – CSR Manager, Tullow Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
Date	16 August 2007

Introduction

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Meeting minutes

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The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

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Meeting minutes

Environmental Resources Management

The Terraces
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Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Nyawaiga
Date of Meeting	Thursday 16th August, 2007.
Present	M/s Nahya Nkinzi – CSR Manager, Tullow Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
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Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
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Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Kabanda & Kijange
Date of Meeting	Friday 17th August, 2007.
Present	M/s Nahya Nkinzi – CSR Manager, Tullow M/s Ashleigh Olsen – Tullow Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
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Meeting minutes

Environmental Resources Management

The Terraces
Block E
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Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Tonya A & B
Date of Meeting	Friday 17th August, 2007.
Present	M/s Nahya Nkinzi – CSR Manager, Tullow M/s Ashleigh Olsen – Tullow Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
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Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Lake Albert Safari Lodge
Date of Meeting	Saturday 18th August, 2007.
Present	Mr. Bruce Martins Mrs. Nicci Martins Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
Date	18 August 2007

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Meeting minutes

Environmental Resources Management

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Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Mbegu
Date of Meeting	Saturday 18th August, 2007.
Present	M/s Ashleigh Olsen – Tullow Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
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Meeting minutes

Environmental Resources Management

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Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Buseruka LC 3 Sub County Head Quarter Offices
Date of Meeting	Sunday 19th August, 2007
Present	Mr. Fred Magambo – LC 3 Chairman Buseruka Council Executives – Buseruka Sub County M/s Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
Date	19 August 2007

ERM

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Alternative 5: This site has recently been added. It is located on the escarpment.

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Meeting minutes

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The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naphtha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naphtha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating.

The foot print of the EPS will include the following facilities:-

- The oil and Gas facility,
- Access roads,
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- Temporary and permanent camps

The construction phase will take about 4 months. This process will involve construction of a temporary camp of about 140 people (110 – local and 30 expatriates). The construction will be modularised meaning the equipment will be pre-built and brought into the site by trucks. An engineering company called Genesis in the UK is responsible for putting up the tenders for the construction.

The amount of water needed for the project is approximately 5,000 barrels of water per day (bpd), to use as injection water to maintain the reservoir pressure. In time the injection water will begin to re-circulate and hence demand for fresh water will drop with time. Sources for this fresh water are being examined such as local aquifers or from the lake.

The first stage in this EIA is stakeholder consultation which is currently being undertaken. The next stage in the EIA process will be carrying out studies which will be carried out will include:

- Hydrology
- Social
- Visual– proposed.
- Noise – proposed. It's been a quiet area but with all this activity there is likely to be noise in the area. There is therefore a need to carry out a baseline study and on going monitoring.

- Biodiversity including flora and fauna
- Air quality – find out the air quality before Tullow starts its activities.
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Refer to the minutes for Kaiso-Tonya valley, Kaiso village meeting the 15th of August, 2007 for more detail on the issues raised.

Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Nkondo
Date of Meeting	Monday 20th August, 2007.
Present	Ms Sheila Namuwaya – EACL M/s Gloria Kalyanga - EACL
Distribution	
Date	20 August 2007

Introduction

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Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Buseruka Trading Centre - Buseruka
Date of Meeting	Thursday 23rd August, 2007.
Present	M/s Zöe Day - ERM Ms Sheila Namuwaya – EACL
Distribution	
Date	23August 2007

Introduction

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Meeting minutes

Environmental Resources Management

The Terraces
Block E
Steenberg Office Park
Steenberg, 7945

Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Kabaale Trading Centre - Kabaale
Date of Meeting	Thursday 23rd August, 2007.
Present	M/s Zöe Day - ERM Ms Sheila Namuwaya – EACL
Distribution	
Date	23August 2007

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Meeting minutes

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Subject/Ref	EIA for the Proposed EPS Exploration Area 2, Hoima.
Venue	Kabaale Trading Centre - Kabaale
Date of Meeting	Friday 24th August, 2007.
Present	M/s Zöe Day - ERM Ms Sheila Namuwaya – EACL
Distribution	
Date	24 August 2007

Introduction

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Annex D

Stakeholder Database

Annex D Stakeholder Database

Category	Stakeholder	Contact Person	Position	Email Address	Contact Number
National stakeholders	Advocates Coalition for Development and Environment (ACODE)	Mr. Arthur Bainomugisha Mr. Morrison Rwakakamba	Director Research Research Associate	acode@acode-u.org a.bainomugisha@acode-u.org	0414 530798
	Directorate of Water Development, Entebbe		Director		0414 220777
	Water Resources Management Department	Ms Adongo			
	Directorate of Water Development, Luzira		Director		0414 505945/ 505942/220374
	Environmental Alert	Mr. Katerega Mrs Dorothy Kaggwa	Executive Director Senior Programme Officer	envalert@envalert.org dkaggwa@envalert.org	0414 510547 / 510215 0414 510547
	Fisheries Department	Bakunda Aventino	for Commissioner	fishery_department@yahoo.com	0414 320578/320563
	National Association of Professional Environmentalists Ltd	Mr. Frank Muramuzi	Executive Director	nape@utlonline.co.ug	0414 534453
	National Environmental Management Authority	Mr. Arthur Waiswa Ayazika Ms Lynda Biribonwa	EIA Coordinator Senior Environmental Inspector	wayazika@nemaug.org lbiribonwa@nemaug.org	041 251064
	Nature Uganda	Mr. Achilles Byaruhanga	Executive Director	achillesbyaruhanga@natureuganda.org	0414 540719
	Nile Basin Discourse Forum	Mr. Melakou Tegegn	Discourse Coordinator	coordinator@nilebasindiscourse.org	0414 322432
	Nile Basin Discourse Forum - Ugandan Chapter	Ms Sarah Naigaga	Country Coordinator		
	Petroleum Exploration and Production Department	Mr. Reuben Kashamubuzi Mr. Bernard Ongodia Mr. Frank Mugisha	Commissioner Senior Geophysicist Principal Geophysicist	pepdebb@petroleum.go.ug	0414 320714
	EcoTrust - Environmental Conservation Trust	Ms Pauline Nantongo		support@ecotrust.or.ug	
	EcoTrust	Mr. Gerald Kairu	Programme Officer	ecp_gerald@hotmail.com support@ecotrust.or.ug	
	Uganda Wildlife Education Centre	Dr. Andrew G. Seguya	Executive Director	director@uweczoo.org	0414 322169

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	Uganda Wildlife Authority	Ms Eunice Namara Ms Justine Namara	Director Tourism Business Dev't & Planning Senior Planning & EIA Coordinator	eunice.mahoro@uwa.or.ug justine.namara@uwa.or.ug	0414 346287/8/9
	Uganda Wildlife Authority	Sam Mwandha			
	Uganda Wildlife Society	Ms Annet Nakyeyune	Executive Secretary	uws@imul.com annetmarie@hotmail.com	0414 530891/484
	World Conservation Union (IUCN)	Ms Barbara Nakangu Bugembe Mr. Alex Muhweezi	Programme Officer Uganda Country Director	barbara.nakangu@iucn.co.ug alex.Muhweezi@iucn.co.ug	0414 344508 / 233738
	WWF	David Duli	Country Coordinator	dduli@wwfuganda.org/ kampala@wwfuganda.org	0414 540064/5
	Uganda Media Trust For Environment	Mr Peter Wamboga-Mugirya	Director: Programmes	pwamboga@yahoo.co.uk	
	Wildlife Conservation Society	Mr Isaiah Owiunji	Researcher	iowiunji@wcs.org	
	Wetlands Inspection Division		Ass. Comm		0414- 254706 / 251375
	Nile Basin Initiative	Mr. Patrick Kahangire	Executive Director	nbisec@nilebasin.org	0414 321329 / 321424
	National Forest Authority		Executive Director Director Field Operations	info@nfa.org.ug	0414 230365/9 031 264035/6
	Makerere University Institute of Environment - MUIENR	Dr. Frank Kansiime	Director		
District Stakeholders	Resident District Commissioner	Ms Asiimwe Martha	RDC		0772 988888
	Chief Administrative Officer	Mr. Walter Iriama	CAO		0772 589937
	District Environment Officer	M/s Joselyne Nyangoma	Senior Environment Officer		0772 628153
	District Fisheries Officer	Mr. Richard Rugadya	Senior Fisheries Officer	richard2f@yahoo.co.uk	0772 461236
	LC 5 Chairperson				
	LC V Vice- Chairperson	Mr Edward Billy Kyamulesire	Vice Chairman LC V		0782 880796
	District Planner	Mr. John Byakagaba	Planner	jwbyakagaba@yahoo.com	0772 437940
	WWF (Lake Albert Eastern Catchment	Mr. Christopher Kasamba	Project Coordinator	Ckasamba@wwfuganda.org	0465 40666
	Initiatives Management Project)	Mr.John Rusoke	Project Extensionist	jrusoke@wwfuganda.org	0465 40666
	WWF	Ms Lydia	Secretary		0772 507141

Category	Stakeholder	Contact Person	Position	Email Address	Contact Number
	District Medical Officer	Mr. Ruyonga			0772 611467
	Kaiso Beach Management Unit Chairman, Hoima				
	District Water Officer, Hoima	Mr. Ibrahim Luswata			
	District Engineer, Hoima	Geofrrey Obara			
	Secretary For Land Board	Mr. Edward Asiimwe			0772 473979
	Resident District Commissioner	Ms Asiimwe Martha			
Local stakeholders	National Lake Rescue Institute	Ms Joanna McDonald	Operations Manager	joanna.mcdonald@lake-recue.org	0712 475757
	Lake Albert Safari Lodge (Tourism)	Mr. Bruce Martins	Lodge Owner	reservations@lakealbertlodge.com	0772 221003
	Lake Albert Safaris Ltd. (Kabwoya Wildlife Reserve Management)		Reserve Manager		
	LC 1 Chairperson Kaseeta Village	Mr. Deo Asaba	LC1 Chairperson		
	LC1 Chairperson Kaiso village	Mr. Irumba Henry	LC1 Chairperson		0782 733980
	LC1 Secretary for Production	Mr. Robert Mujuni			0751 906678
	LC1 Chairperson Sebagoro village		LC1 Chairperson		0773 190871
	LC1 Chairperson Tonya A & B villages	Mr. Steven Balikenda Mr. Katusiime Fred	LC1 Chairperson		0782 565220
	LC1 Chairperson Nyawaiga village	Mr. Stephen Okello	LC1 Chairperson		
	LC1 Chairperson Nkondo village	Mr. Moro Budwen	LC1 Chairperson		0752572121
	LC1 Chairperson Mbegu village	Mr. Irumba	LC1 Chairperson		0752594998
	LC1 Chairperson of Kyehoro village	Mr. Kasangaki Ofungi	LC1 Chairperson		0752 564522
	LC1 Chairperson Kabanda village		LC1 Chairperson		
	LC1 Chairperson Kijange village	Mr. Agusi	LC1 Chairperson		0753386171
	LC Chairperson Buseruka Sub County	Mr. Magambo			0782 166746
	Lt. Col. David Kabwoyo	Lt. Col. David Kabwoyo	UPDF – In charge of security		0772 434046

Annex E

Background Information Document

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED EARLY PRODUCTION SYSTEM, LAKE ALBERT, EXPLORATION AREA 2 – UGANDA.

Background Information Document

July 2007

Prepared for:

Tullow Uganda Operations Pty Ltd

www.tullowoil.com

Prepared by:

Environmental Resources Management
Cape Town, South Africa

www.erm.com

Environmental Assessment Consult Limited
Kampala, Uganda

www.eaclug.net

1. Introduction

The primary petroleum prospect area in Uganda is the Albertine Graben. This area is located in the northernmost part of the western rift of the East Africa Rift System. The Albertine Graben stretches from the border of Sudan in the north, to Lake Edward in the south. Although varying in width, it is approximately 45 km wide, extending in some areas into the DRC.

The Government of Uganda subdivided the Ugandan part of the Graben into five petroleum exploration areas. Lake Albert is located towards the northern extremity of the Graben and is covered by Exploration Areas 1, 2 and 3A. Tullow Oil (Tullow) and Heritage Oil have been involved in oil exploration activities in this Lake Albert area since 2003. As illustrated below in *Figure 1*, Tullow Oil (Tullow) is a non operational partner that currently holds 50% interest in both Exploration Areas 1 and 3A, and 100% interest in Exploration Area 2.

In total only 584 line km of onshore 2D seismic data, 1,600 line km of lake seismic data and 390 km^2 of 3D seismic data have been acquired to date. Exploration wells have been drilled in three of the five prospect areas in the Graben. Several EIA have been undertaken for these exploration activities.

Tullow have an MoU with the Government of Uganda to develop an onshore Early Production System (EPS). In terms of the EIA Regulations (1998) the environment Tulllow has appointed Environmental Resources Management (ERM) Southern Africa (Pty) Ltd to undertake an Environmental Impact Assessment (EIA) for the proposed Early Production System, Kaiso Tonya Area, Exploration Area 2, Uganda (see *Figure 2*).

2. Purpose of this Document

The purpose of this Background Information Document (BID), which is part of the EIA process, is to:

- Inform stakeholders of the planned Early Production System, and to
- Invite stakeholders to comment and participate in the EIA.

The BID also refers to relevant legislation, describes the EIA process, provides general information on the activities to be undertaken and highlights some of the key issues regarding the potential impacts of these activities.

A large number of stakeholders will be consulted regarding the scope of the intended activities. These will include but will not be limited to:

- National, Provincial and Local Authorities;
- Local communities, including fishing communities and associations;
- Local business and tourism operators;
- Non-governmental Organizations; and
- Conservation and environmental groups.

3. Relevant Legislation

In Uganda, the Environmental Impact Assessment process is a legal requirement under the National Environmental Statute, 1995, a process which in turn is governed by the EIA Regulations of 1998.

Environmental Management

Under the National Environment Statute, 1995, the National Environmental Management Authority (NEMA) is the principal agency for the management of the environment and is delegated the responsibility to coordinate, monitor and supervise all activities in the field of the environment. The National Environment Statute, 1995 provides tools for environmental management including EIAs. The Statute imposes a mandatory duty on a project developer to have an EIA conducted and approved before embarking on a project. The EIA Regulations, 1998 specifies the types of projects to be subject to EIAs.

EIA Regulations, 1998

Petroleum Exploration and production is identified as a Category III listed activity requiring a full EIA. The EIA Regulations (NEMA, 1998) recognise the following stages of EIA in Uganda:

- Project brief formulation
- Screening
- EIA Study
- Decision making
- Environmental monitoring and auditing

Petroleum (Conduct of Exploration Operations) Regulations, 1993

Under the Petroleum Act, the Petroleum Exploration and Production Department (PEPD) in the Ministry of Energy and Minerals Development (MEMD) is the technical arm responsible for the initiation and supervision of petroleum exploration end production agreements and manages data relevant to upstream petroleum activities in the country.

Regulation Number 51 (1) of the Regulations provides pollution prevention obligations. It states that in carrying out exploration, development and production operations and transportation of oil and gas, the licence holder shall operate in a manner that ensures the prevention of pollution of the environment. Regulation 53 (1) states that before drilling operations are commenced in any licensed area, the person in charge shall submit for approval by the commissioner, a description of procedures, personnel, equipment and materials that will be used in monitoring, cleaning, and prevention of the spread of any pollution arising from exploration or development activities.

International Agreements and Conventions

Uganda has signed and /or ratified several international agreements relating to the environment, both global and regional. Some of these international agreements and conventions that are, in particular, relevant to this project are listed below:

- Nile Basin Treaty;
- World Heritage Convention;
- Convention on Biological Diversity;
- Convention on Migratory Species and Wild Animals;
- Convention on Wetlands of International Importance (RAMSAR);
- African Convention on Nature and Conservation of Natural Resources.

4. Invitation to comment on the EIA Process

You are invited to comment on the proposed project and EIA process by completing the form on the final page. You may submit your comments to:

Environmental Assessment Consult Limited

Kisozi House, Plot 8, Kyagwe Road,
P.O. Box 3128, Kampala Uganda.
Tel: +256 (0) 772 434155; +256 (0) 414 343405
Fax: +256 (0) 41 343405
Email: eacl@infocom.co.ug

Attention: Mr Moses Kagoda
Ref: EIA EPS

5. The Environmental and Social Impact Assessment (EIA) Process

The EIA will be conducted in compliance with all applicable environmental legal requirements and will study the impacts associated with an EPS.

The EIA process is divided into a number of phases which are discussed below:

Phase 1: Screening and Scoping Phase

The Screening and Scoping Phase will commence with the submission of a project brief document to National Environmental Management Authority (NEMA) to provide sufficient and relevant information on the proposed project that can allow NEMA to establish whether or not the project is likely to have significant impacts and to determine the level of EIA required.

Petroleum exploration and production (starting with appraisal drilling) is classified as a Category III activity in terms of the EIA Regulations (1998) which requires a full EIA. ERM will thus be undertaking a full EIA for the project.

Screening and scoping will also involve initial consultation with key stakeholders, through the distribution of this Background Information Document, and through one on one meetings and focus group meetings. Meetings are planned with key stakeholders in Kampala and Hoima and public village meetings will be held at local villages in the vicinity of the proposed EPS site.

The objectives of the Scoping Phase are to:

- Identify possible adverse and positive impacts that the project may have on the socio-economic and biophysical environment;
- Identify potential fatal flaws;
- Inform stakeholders of the project and allow the to raise issues of concern; and
- Identify and describe those aspects which will require detailed investigation under Phase 2 of the EIA process.

The final product of this first phase is the Terms of Reference for the EIA, which will be submitted to the NEMA for consideration and approval.

Phase 2: Specialist Studies

Specialist baseline data gathering studies are undertaken to provide an understanding of the affected environment in order to be able to undertake an assessment of the impacts associated with the development of the Early Production System, in parallel to the preparation of the Terms of Reference.

The following baseline studies are currently being undertaken in support of the EIA for the proposed EPS:

- Air Quality Study;
- Socio-economic Study;
- Waste Management Study;
- Ground and Surface Water Study;
- Flora and Fauna [including vegetation, birds; mammals; frogs and reptiles and invertebrates (butterflies and dragonflies)];
- Noise Study;
- Visual Study; and
- Archaeological and Cultural Resources Study.

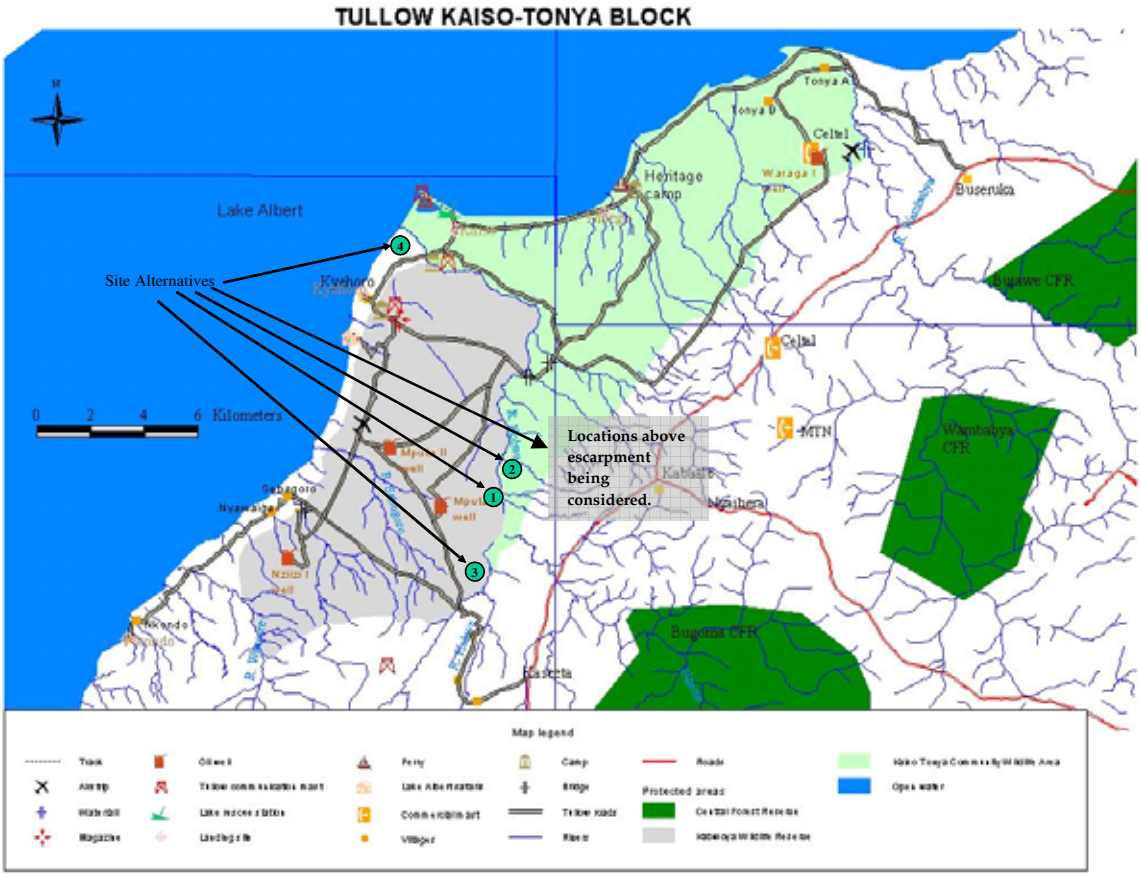
Phase 3: Environmental Impact Assessment Study

The results of the specialist studies will be integrated into a Draft Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) which will be prepared in accordance with legal requirements.

The Draft EIS will provide recommendations on the mitigation of adverse impacts and the enhancement of positive impacts associated with activities. The mitigation measures detailed in the EMPs will be clear, practical and applicable to the local conditions and will be based on good oil and gas field practice. The effective implementation of the EMPs will thus ensure that the project will be conducted and managed in an environmentally acceptable and responsible manner.

The outcome of the Draft EIS and EMP will be presented to key stakeholders. A Final EIS and EMP will be produced reflecting all the comments and inputs received from stakeholders. This will be submitted to NEMA for final consideration and decision-making. If NEMA approves the proposed activities, an environmental license will be issued for the EPS project. All associated exploration activities will be governed by the approved EMPs.

Figure 1: Map showing the Kaiso Tonya Valley and the proposed alternative locations of the EPS



8. Project Description

8.1 Introduction

The development plan is to build an Early Production System (EPS) rated at 4,000 barrels per day (bpd). Production wells (Kaiso Tonya Area) and injection wells will be connected via flowlines to the central processing facility of the EPS. The oil has a high wax content and this leads to a high pour point (40^{o}C). In other words if the oil reaches any temperature below 40^{o}C it will solidify. It is thus not easy to transport the oil over large distances as it will need to be heated resulting in unacceptably high costs.

The 4,000 bpd of oil will be fed into the EPS to produce 3200 bpd of Heavy Fuel Oil (HFO), 500 bpd of diesel, 120 bpd of kerosene and 180 bpd of naptha. The HFO will be used to generate electrical power export of 50 MW with new transmission lines for the export of electricity. All other liquid products will be exported by road tankers. There is also likely to be residual HFO over and above that required for power generation, and this will also be exported by road. A market for naptha is yet to be identified but it is generally a high value product sought by refiners. Gas produced on the plant will be used locally for power or heating. A diagram of the proposed EPS facility is presented in *Figure 3*.

8.2 Alternative locations of the EPS

A number of alternative sites are being considered for the location of the EPS. Each site will be assessed against environmental and social criteria and the selected site will be subjected to a more detailed impact assessment.

Alternative 1: Within the Kabwoya Wildlife Reserve as close to Mputa 1, 2 and 3 wells as possible.

Alternative 2: Further East outside the Kobwoya Wildlife area i.e. within the Kaiso Tonya Community Wildlife Area on the opposite side of the Hohwa River.

Alternative 3: Within the Kabwoya Wildlife Reserve but more south of Mputa 2 and 3 close to the base of the escarpment.

Alternative 4: Outside both the Kabwoya Wildlife Reserve and the Kaiso Tonya Community Wildlife Area, to the south-west of the Ngassa Spit.

Alternative 5: On top of the escarpment close to the existing road.

8.3 Construction Phase

- Production facilities are to be modularised, as far as possible, before transport to site in order to minimise the number of construction hours on site and in order to improve the project schedule. The size of the modules will be dictated by logistical constraints and this will be determined during detailed design following contract award.
- The construction period is estimated to take 4 months with a temporary crew size of approximately 140 personnel. This will be comprised of 30 main contractor specialists and 110 local workforce. As discussed above, a camp will be required for this period with rotational leave for the labour force (most likely on a monthly basis).
- The construction activities will include: site clearance, roads, trucks movement, etc.

8.4 Operational Phase

- The operations phase will be undertaken on a continuous 24 hour 7 day week basis. The operating team size will be in the order of 40 personnel who will operate and maintain the plant, including the loading and despatch of delivery vehicles, and support staff to provide living, medical and administration services.
- A permanent accommodation facility is planned which will be based on the permanent operating team size and for any specialist service providers and others who will visit the plant from time to time.
- Discharges from the plant will be exhaust gas from heating and generating units and effluents or contaminated materials generated during the production process. All combustion devises will be selected on the basis of meeting the international standard on emissions. Contaminated water will be injected into aquifers selected on the basis of zero risk of contamination of surface water supplies used in the area. Heavy contaminated waste will be sent for disposal at approved sites in Uganda in accordance with good waste management practice and as part of an approved waste management plan.

9. List of key Environmental Issues

A number of environmental issues relating to early production systems facilities have been identified in previous EIA's undertaken in other parts of the world. These issues will be investigated in detail in the EIA. These include:

During Construction

- Long-term effects from vegetation clearance, erosion, changes to surface hydrology, introduction of barriers to wildlife movement;
- Increase disturbance from transportation, traffic volumes, density, impact on local infrastructure, disturbance to local population and wildlife;
- Larger scale, construction activities, noise, vibration, emissions related to earthworks;
- Aesthetic and visual intrusion; and
- Increased demand on local infrastructure water supply, sewage, solid waste disposal.

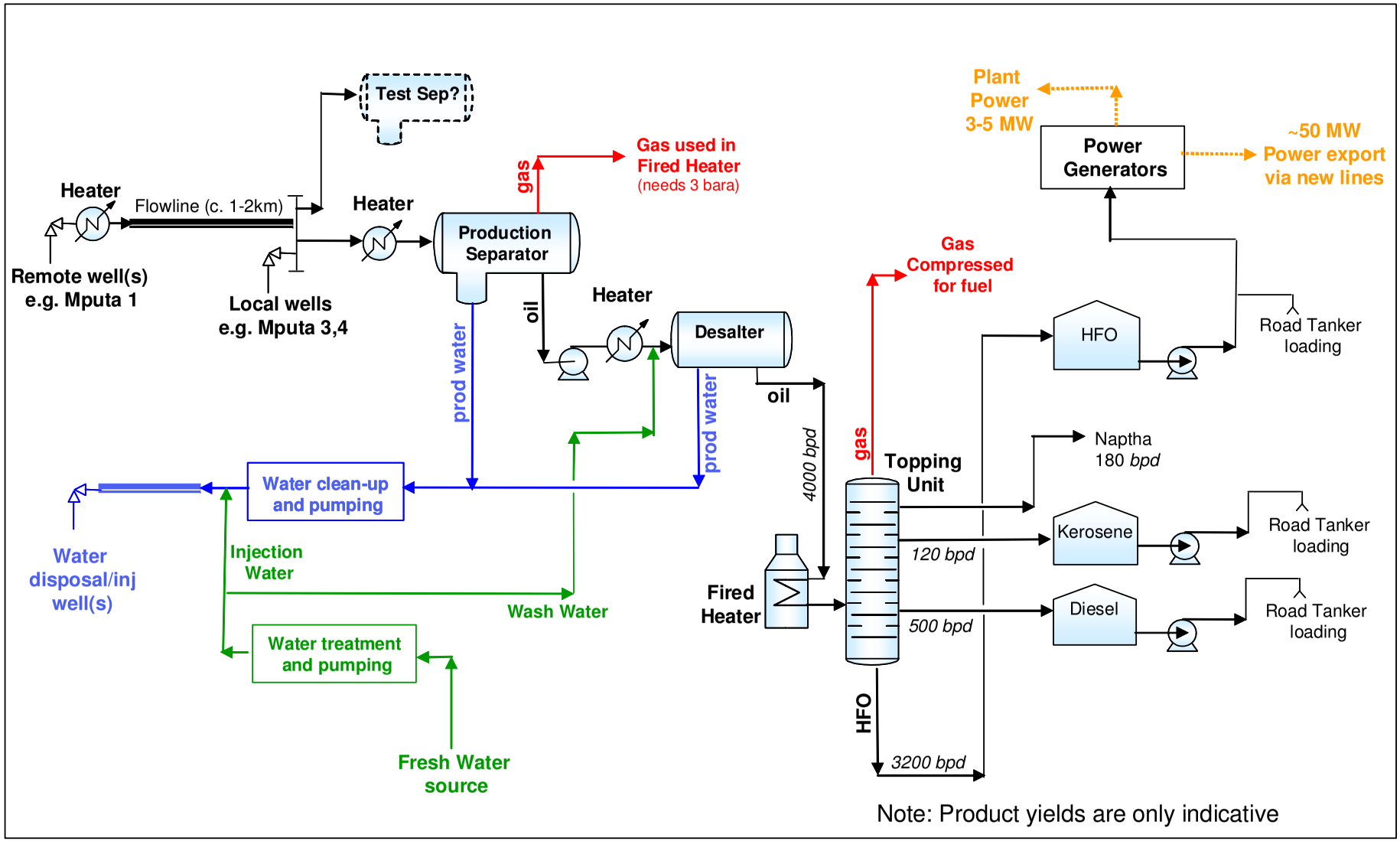
During Operation

- Increased discharges and emissions from: production processes (waste water, produced water, sewage and sanitary wastes, drainage); and power and process plant (waste gases, flaring, noise, vibration, light);
- Potential effects on biota, wildlife disturbance, habitat, biodiversity, water, soil and air quality;
- Increased risks of soil and water contamination from spillage and leakage;
- Long-term permanent presence of facilities and workforce;
- Increased demand on local infrastructure, socio-economic and cultural impacts (labour force, employment, education, medical and other services, local economy, effects on indigenous populations.
- Land use conflicts; and
- Visual and aesthetic intrusion.

10. Information Dissemination

Background information and progress on this EIA process will be available on Environmental Resources Management's website (www.erm.com/TullowEPS)

Figure 3: Proposed EPS Facility



Source: Tullow Oil

RESPONSE SHEET

INTERESTED AND AFFECTED PARTIES RESPONSE SHEET FOR THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED EARLY PRODUCTION SYSTEM, LAKE ALBERT, EXPLORATION AREA 2 – UGANDA.

Please include your comments on this form and return it to Mr Moses Kagoda of EACL, at Kisozi House, Plot 8, Kyagwe Road, P.O. Box 3128, Kampala Uganda, Tel: +256 (0) 772 434155 / +256 (0) 414 343405, Fax: +256 (0) 41 343405, Email: eacl@infocom.co.ug. If you would like to make additional comments please append these to the form.

Your response should reach EACL by 1 August 2007. Should you have any questions or uncertainties about the project please contact Mr Moses Kagoda of EACL.

1. Are there any Interested and Affected Parties not on the provisional lists whom you believe should be consulted during the course of the EIA? See list of stakeholders on page 8.

YES	NO

(Please check the appropriate box)

If yes, please indicate the name, organisation (if applicable), postal address, telephone and fax numbers of the person(s) concerned.

_____

_____

2. Are you satisfied that the proposed EIA process is open and thorough and provides an acceptable approach which will assist decision-making by the relevant Government authority?

YES	NO

(Please check the appropriate box)

If no, please indicate how you would like to see the process changed.

_____

_____

3. Are there any issues about the proposed project that you would like to draw to the attention of the EIA Team at this stage?

YES	NO

(Please check the appropriate box)

If yes, please describe the issues.

_____

_____

_____

Name _____

Address _____ Tel _____

_____ Fax _____

E-mail _____ Cell Phone _____

THANK YOU FOR YOUR PARTICIPATION.

LIST OF STAKEHOLDERS

Stakeholders
National stakeholders
Advocates Coalition for Development and Environment
Directorate of Water Development
Ecological Christian Organisation
Environmental Alert
Fisheries Department
GreenWatch
National Association of Professional Environmentalists Ltd
National Environmental Management Authority
Nature Uganda
Nile Basin Discourse Forum
Petroleum Exploration and Production Department
Rural Development Media Communications
Uganda Coalition for Sustainable Development
Uganda Wildlife Authority (UWA)
Uganda Wildlife Society
World Conservation Union (IUCN)
WWF
National Forestry Association
Water Resources Management Department
National Forestry Association
Geology Department
Energy Department
Wetlands Inspection Division
Lake Edwards and Albert Fisheries Project (LEAF)
Uganda Fish and Fisheries Conservation Association (UFFCA)
Uganda Nile Discourse Forum – National Chapter
Environmental Conservation Trust (EcoTrust)
Uganda Wildlife Education Centre
Makerere University Institute of Environment and Natural Resources
District Stakeholders
Chief Administrative Officer
District Environment Officer
Fisheries Department
LC5 Chairperson
District Planner
WWF
Development Secretary of Hoima
Resident District Commissioner - Hoima
Health Inspector
Directorate of Works
Directorate of Production
Community Development Officers
District Forest Services
Local stakeholders
National Lake Rescue Institute (NLRI)
Hoima Medical
Lt. Col. David Kabwoyo
Lake Albert Safari Lodge
LC1 Chairperson Kaiso
LC1 Secretary for production
LC1 Chairperson of Kaiso village
LC1 Chairperson of Tonya village

Stakeholders
LC1 Chairperson of Kyehoro village
LC1 Chairperson of Sebagoro village
LC1 Chairperson of Nyawaiga village
Uganda Wildlife Authority - Kaboya
Kinngdom of Buneyro Kitaro

Annex F

Waste Inventory Tables

Table 1 Tullow Oil - Mputa Early Production System Hazardous Waste Inventory

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	BASEL CONVENTION CLASSIFICATION	ALTERNATIVE RECYCLING, TREATMENT & DISPOSAL TECHNOLOGIES	COMMENT
Acidic Wastes	Spent pickling and cleaning acids	During construction and maintenance of plant.		Corrosive (sulphuric acid, hydrochloric acid) and will contain heavy metals.	Y17 Wastes arising from the surface treatment of metals and plastics.	• Neutralise with lime and dispose residues to landfill	Metal pipes and parts require cleaning during construction of the plant.
Batteries	Lead-Acid Batteries	Vehicles		Corrosive (sulphuric acid), Lead compounds.	A1160 Waste Lead Acid Batteries Whole or Crushed.	• Return to supplier for recycling; • Treat, Contain and Dispose to Landfill.	
	Dry Cell Batteries	Electrical Equipment		Heavy metals, e.g. Zn, Mn, ammonium chloride. May be corrosive acid or alkaline.	A1170 Unsorted waste batteries	Treat, Contain and Dispose to Landfill	
	Metal Hydride, Li Ion NiCad	Cell Phones, computers, etc.		Heavy metals, e.g. Cadmium, Lithium and Nickel	A1170 Unsorted Waste batteries	• Return to supplier for recycling; • Treat, Contain and Dispose to Landfill.	
E-Waste	VDU's Computer Waste Cell Phones Printer Cartidges	Various		Heavy metals including Cadmium, Nickel and Lithium from batteries	A1180 Waste Electrical or electronic assemblies or scrap.	• Recycle • Treat, Contain and Dispose to Landfill	
Fluorescent Tubes		Various		Mercury	A1030 Waste containing Mercury and mercury compounds	Treat, contain and dispose as hazardous waste	Treat with sodium sulphide and sulphur: see text.

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	BASEL CONVENTION CLASSIFICATION	ALTERNATIVE RECYCLING, TREATMENT & DISPOSAL TECHNOLOGIES	COMMENT
Laboratory Waste	Residues	Laboratory		Can be flammable, corrosive, reactive and/or toxic.	Various	Separation of various wastes.	A waste management programme for laboratory needs to be developed.
	"Empty" Containers	Various		Can be flammable, corrosive, reactive and/or toxic.	A4130 Waste packages containing Annex I substances in sufficient concentrations to exhibit Annex II characteristics.	Clean and dispose as General or Hazardous Waste.	
Oily (Hydrocarbon) Waste	Crude Oil Desalter Sludge	Process		High salt and petroleum hydrocarbons, PAHs Flammable? Corrosive?	Y9; A4060 Waste Oils / water, hydrocarbons / water mixtures, emulsions.	• Thermal treatment; • Treat, contain and disposal to landfill.	
	Oily water	• Oily Water Drains from Processing Area • Process oily water		Petroleum Hydrocarbons, PAHs		• Oil seperators for recovery of oil • Oil returned to process or use as HFO	
	Oily Sand / Scale and Sludge	• Oily Water Drains • Oil Separators • Pipelines • Storage Tanks		Petroleum hydrocarbons, PAHs		• Thermal treatment; • Composting; • Treat, contain and disposal to landfill.	
	Drilling Fluids and Cuttings	Well drilling and deepening		Hich salt and petroleum hydrocarbons, PAHs, bentonite clay, water, barium sulphate and specialised additives.		• Thermal treatment; • Treat, contain and disposal to landfill.	

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	BASEL CONVENTION CLASSIFICATION	ALTERNATIVE RECYCLING, TREATMENT & DISPOSAL TECHNOLOGIES	COMMENT
	Hydraulic Oil and Pipes	Mechanical Workshops		Petroleum hydrocarbons, heavy metals.		• Recover oil for fuel; • Dispose pipes to landfill	
	Lubricating Oil	Mechanical Workshops		Petroleum hydrocarbons, heavy metal compounds present as additives, e.g. Zn, Mo, etc.		• Recover Oil and use as HFO, or • External recycling company.	
	Grease	Mechanical Workshops		Can contain Heavy Metals and Antimony as additives		• Recover where possible and include in used oil/HFO; • Thermal treatment; • Compost; • Dispose to landfill.	
	Cutting Oil	Mechanical Workshops		Petroleum Hydrocarbons, heavy metal compounds present as additives.		• Recycle as fuel; • Thermal treatment of solid reidues	
	Contaminated Rags	Mechanical Workshops		Petroleum hydrocarbons, degreasers		Thermal treatment and/or Disposal to landfill.	
	Oil Contaminated Soil / Adsorbents	• Mechanical Workshops • Product Collection Areas • Refuelling Areas		Petroleum hydrocarbons, degreasers		• Thermal treatment; • Composting; • Diposal to landfill	
	Oil Filters	Mechanical Workshops		Petroleum hydrocarbons, degreasers		• Recover oil and recycle metal components.	

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	BASEL CONVENTION CLASSIFICATION	ALTERNATIVE RECYCLING, TREATMENT & DISPOSAL TECHNOLOGIES	COMMENT
Paint	Water based	Various		Contain biocides	B4010 Water based paints	Allow "empty" containers to dry and dispose as Hazardous or General Waste	Green Purchasing Programme
	Solvent based	Various		Flammable solvents	A4010 Waste paints		
Solvents	Non-halogenated			Potentially flammable, toxic	Y42 Organic Solvent excluding halogenated solvent	• Recover and use as fuel • Treat, contain and dispose as hazardous waste	
	Halogenated			Potentially flammable, highly toxic, particularly to aquatic species	Y41 Halogenated Solvents	Treat, contain and dispose as hazardous waste	Avoid using via Green Purchasing Programme
Clinical (Health Care Risk Waste)	Sharps	Medical Facility	Approximately 1 box/month	Infectious – needle stick injuries, etc.	Y1, A4020 Clinical Wastes	Sterilisation Incineration Sterilised residues or ash to landfill	
	General Infectious Waste	Medical Facility	Approximately 1 box/month	Infectious	Y1, A4020 Clinical Wastes	Sterilisation Incineration Sterilised residues or ash to landfill	May contain small amounts of anatomical waste.
	Pharmaceutical / Chemical Waste	Medical Facility	Very little	Toxic Can include solvents	Y3 Waste Pharmaceuticals and Drugs	Incineration Dispose as chemical waste	
	Anatomical Waste	Medical Facility	None?	Infectious and objectionable	Y1, A4020 Clinical Wastes	Incineration	No anatomical waste expected as severely injured or very sick patients will be evacuated to hospital.
Salt Waste	Demin Sludge	Boiler (electrically heated)		Saline, some heavy metals		Treat, contain and dispose as hazardous waste.	

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	BASEL CONVENTION CLASSIFICATION	ALTERNATIVE RECYCLING, TREATMENT & DISPOSAL TECHNOLOGIES	COMMENT
Transformer Oil	Non-PCB			Possibly toxic			PCB containing fluids should not be used: Green Purchasing programme.
Waste Treatment Sludges	Sediment and sludges	Potable Water Treatment		Heavy metals		Treat, contain and dispose as hazardous waste.	
		Potable Water Treatment		Meavy metals, some oil may be present		Treat, contain and dispose as hazardous waste.	
Waste Chemicals	De-emulsifiers			Toxic	Various	Treat, contain and dispose as hazardous waste.	
	Degreasers			Corrosive, may contain organic solvents		Treat, contain and dispose as hazardous waste.	
	Detergents and Cleaning Chemicals			May be corrosive and can contain chlorine chemicals. Detergents are toxic to aquatic organisms.		Treat, contain and dispose as hazardous waste.	
	Corrosion Inhibitors					Treat, contain and dispose as hazardous waste.	
	Contaminated Containers and Packaging			May be toxic	A4130 Waste packages	Rinse empty containers and recycle or dispose to general or hazardous waste landfill.	Containers should be destroyed or made unusable to prevent reuse, e.g. as water containers.

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	BASEL CONVENTION CLASSIFICATION	ALTERNATIVE RECYCLING, TREATMENT & DISPOSAL TECHNOLOGIES	COMMENT
	Biocides, Pesticides and Herbicides			Toxic	A4030 Wastes from the production, preparations and use of biocides, including pesticides and herbicides.	Treat, contain and dispose as hazardous waste.	
	Drilling Chemicals			Toxic	Various	Treat, contain and dispose as hazardous waste.	
NORM Waste	Scale			May be classified as radioactive.		Test to determine if the waste classifies as radioactive, a separate safe storage facility may be required. Otherwise treat, contain and dispose as hazardous waste.	To be tested prior to disposal: scale may have higher levels of radioactivity than sand and other natural solids.
	Sand			May be classified as radioactive.		Test for radioactivity and then treat, contain and dispose as hazardous waste.	Initial tests indicate that levels low and would not classify as radioactive.
Sewage Waste	Sewage Sludge	Sewage Treatment Plant		Infectious, may contain hazardous concentrations of heavy metals.		Dry and use beneficially as organic fertiliser on farms.	Maximum 70 to 140 persons plus family members.
	Sewage Screenings	Sewage Treatment Plant		Infectious, objectionable		• Incinerate; or • Treat and Dispose to landfill.	Maximum 70 to 140 persons plus family members.

Table 2 Tullow Oil - MPuta Early Production System Non-hazardous Waste Inventory

WASTE TYPE	DESCRIPTION	SOURCE	QUANTITY	CLASSIFICATION	TREATMENT/DISPOSAL TECHNOLOGY	COMMENT
Scrap Metal	Various	During construction operation and closure		B1010 Metal and Metalalloy wastes in metallic non-dispersible form	Recycle and recover	Outside contractor
Grass Cuttings, Weeds	Gardens and Land clearance	Facility and Fences				A fire break may be needed around the fence line.
Domestic (General) Waste			150 to 300 kg/day	Y46 Waste Collected from Households	Recycle, dispose of residues to landfill	Maximum 70 to 140 persons
Wood Waste	Packaging					
Office Waste	Paper, etc					
Canteem Waste	Packaging and Food					
Sand/Soil/Overburden /Rubble	Mainly during construction	Various	Unknown		Utilise during landfill construction or stockpile for use as cover material.	
Cable	Electrical cable (Cu / Al	During construction, operation and closure.			Recycle	Outside contractor

Table 3 *Tullow Oil - MPuta Early Production System Effluent Inventory*

EFFLUENT TYPE	DESCRIPTION	SOURCE	QUANTITY	HAZARDOUS CHARACTERISTICS	CLASSIFICATION	TREATMENT TECHNOLOGY	COMMENT
Produced Water		Crude oil	53m³/hr			• Disharge to Contaminated/Production water dam via oil separator/sludge trap; • Analyse and utilise as production water.	
Filter backwash		Lake Water	2.5 m³/hr			• None necessary, as it is uncontaminated, - discharge to environment	May require disposal if the quality of the discharge decreases in the future.
Contaminated Run-off Water		"Dirty" areas of site	Peak flow 16695 m³/hr		Hazardous due to oil contamination.	• Discharge first half hour to 10000 m³ contaminated water dam via oil separator/sludge trap; • Analyse and transfer treated water to "clean" water dam	Management of hazardous chemicals must be good to minimise potential contamination of water.
"Clean" Run-off Water		"Clean" areas of site				• Discharge to clean water dam via sludge trap; • Analyse and discharge to water course according to regulations; or • Utilise as process make up water.	
Laboratory Effluent	Contaminated water from Chemical Drain Tanks	Laboratory				• Flocculation followed by filtration and disposal of solids to landfill • Treated water to contaminated or clean water dam depending on analytical quality.	Presence of heavy metal and various organic wastes.

Annex G

Initial Site Selection Criteria

G1 INITIAL TECHINICAL CRITERIA TO SELECT LOCATION OF VARIOUS SITE OPTIONS

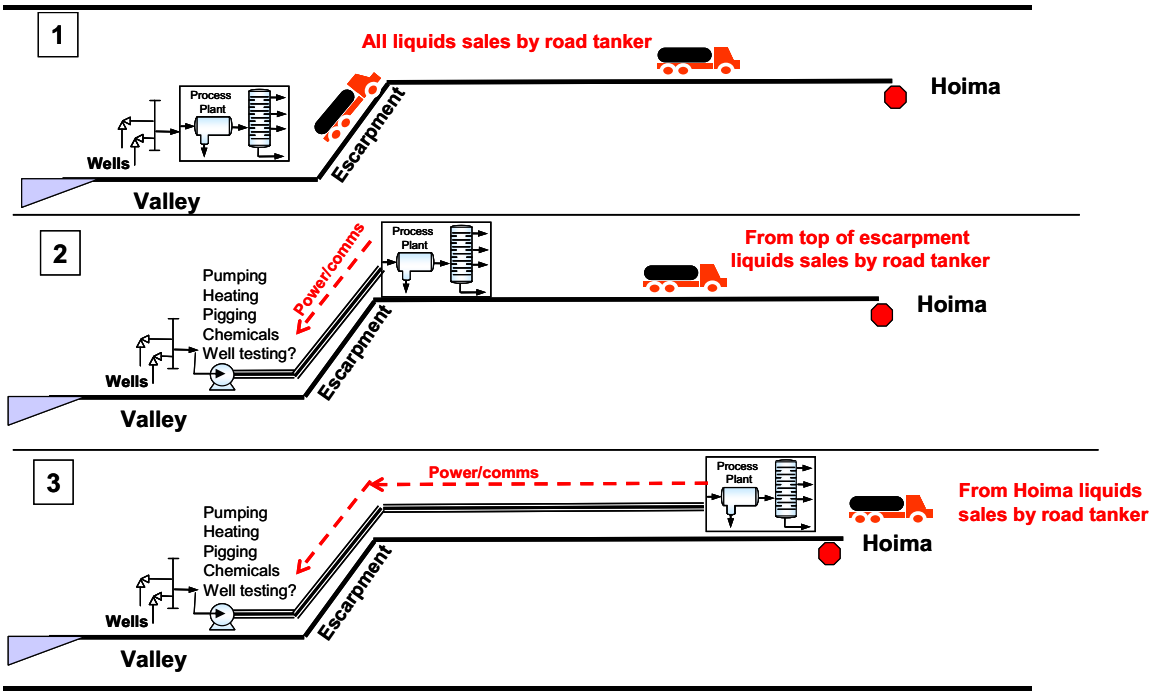
G1.1 SITE LOCATIONS CONSIDERED

Three site locations were initially considered for the EPS including:

- Near wells in the Kaiso-Tonya Valley;
- Top of escarpment; and
- Hoima.

Figure 1.1 outlines the proposed processing for each of the three options.

Figure 1.1 Site location



G1.2 REASONING FOR CHOICE OF GENERAL LOCATIONS OF THE EPS

The choice of general location of the EPS was based on the following reasoning:

1. **Well locations** - The **wells** have to be located in the Valley in order to access the reservoir.

2. **Nature of reservoir fluids** - The **flowlines** need to be as short as possible principally because of concerns about flow assurance / wax formation and the energy required to keep the lines warm i.e. because the oil is very waxy (becomes solid at approx. room temperature) it needs to be heated up so that it becomes a liquid and is easy to transport. This requires a

substantial amount of energy and is thus not financially viable if the oil has to be transported long distances. Keeping the flowlines as short as possible also minimises the amount of oil and gas in the lines at any time which has safety and environmental benefits, the land disturbance to install the lines and security concerns.

3. **Route from/to Valley** - The route from/to the Valley is via the escarpment road routed south from the valley area.

As a result of items 1 and 2, only two general locations are possible for the location of the EPS and associated infrastructure:

- All infrastructure is located in the Kaiso-Tonya Valley; or

- The infrastructure is split with the primary separation facilities located in the valley with the remainder of the EPS i.e. Topping Unit and Power Plant being located above the escarpment.

Five sites have been identified in the Kaiso-Tonya Valley, four within the valley and a fifth on top of the escarpment. The fifth site is part of the split infrastructure alternative and location of the primary separation facilities means that Site 5 is still associated with a footprint in the Valley.

Annex H

Air Quality Site 1C vs Site 5

uMN003-07

EVALUATION OF AIR POLLUTION DISPERSION POTENTIAL OF SITE 1C AND SITE 5 FOR THE PROPOSED MPUTA EARLY PRODUCTION SYSTEM, KAISO-TONYA VALLEY, UGANDA

Version 2

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EXECUTIVE SUMMARY

Tullow Oil (Tullow) has a Memorandum of Understanding with the Government of Uganda to develop an on-shore Early Production System (EPS), rated at 4,000 barrels per day (bpd) in the Kaiso-Tonya Valley. Two preferred sites have been identified in the Kaiso-Tonya Valley as suitable for the development of the proposed Mputa EPS, namely Site 1C and Site 5. Site 1C is located in the Valley to the west of the escarpment. Site 5 comprises two sections with one of the three EPS heater units located in the Valley together with two of the eight main generators. The remainder of the plant's facilities are located on top of the escarpment. No gas is available at the top site and instead diesel will be used in the column inlet heaters.

Tullow has appointed Environmental Resources Management (ERM) Southern Africa (Pty) Ltd to undertake the EIA for the proposed Early Production System. ERM in turn appointed uMoya-NILU Consulting (Pty) Ltd to evaluate the relative differences in atmospheric dispersion potential of these two sites. Atmospheric dispersion potential is the ability (or inability) of the atmosphere to disperse pollutants that are emitted into it. It is a function of vertical and horizontal dispersion. Vertical dispersion relates to atmospheric stability and horizontal dispersion is a function of wind and topography.

Being equatorial, the Kaiso-Tonya Valley experiences strong solar heating throughout the year which results in good vertical mixing and efficient vertical dispersion. The horizontal dispersion in the Valley is however impeded by the high frequency of light winds that do not have the ability to carry the pollutants up and over the escarpment and the blocking effect of the escarpment to dispersion by winds from the westerly sector. Pollutants will tend rather to remain below the escarpment where they will accumulate. Dispersion modeling was used to evaluate the difference between the two sites and to compare the predicted ambient concentration of sulphur dioxide (SO_2), oxides of nitrogen (NO_2) and particulate matter (PM_{10}). It is an appropriate tool to assess the relative difference between emissions scenarios.

The comparative dispersion between Site 1C and Site 5 may be summarised as follows:

- The dispersion pattern of predicted annual concentrations for all three pollutants has an extension to the southwest of Site 1C and Site 5 (Valley) and an even spread towards the west towards Lake Albert, decreasing with increasing distance from the sites. The westward spread in the case of Site 5 is less that that for Site 1C emissions. WHO annual ambient air quality guidelines are not exceeded for either case.
- In all cases the predicted annual ambient concentrations are lower for emissions from Site 5 than for emissions from Site 1C. The spreading of the plume to the west over Lake Albert for Site 1C emissions as a result of accumulation of pollutants below the escarpment is not evident for emissions from Site 5.
- The predicted maximum 24-hour and 1-hour concentrations of all three pollutants from emissions from Site 1C result in relatively high ambient concentrations in the

immediate vicinity of the EPS and equally high concentrations to the east of the site in a band along the face of the escarpment where the plume intersects the higher ground under the prevailing westerly winds.

- The highest predicted maximum 24-hour and 1-hour concentrations of all three pollutants resulting from emissions from Site 5 are lower in the immediate vicinity of the EPS than for Site 1C. There is an even spreading of the pollutants towards the east under the prevailing westerly winds and there is little evidence of an accumulation of pollutants in the Valley below the escarpment.
- The maximum predicted 24-hour and 1-hour ambient concentrations of all pollutants are markedly lower for the case of emissions from Site 5 compared with Site 1C. In both cases the WHO ambient air quality guidelines are not exceeded for any of the pollutants except the 1-hour guideline for NO_2.
- In the case of the predicted 1-hour maximum NO_2 concentration the predicted maximum in the Valley drops from 550 to 300 $\mu g/m^3$ for Site 1C and Site 5 respectively and from 400 to 200 $\mu g/m^3$ for Site 1C and Site 5 respectively along the escarpment. The spatial extent of the predicted high concentrations is considerably reduced in the case of emissions from the Site 5 EPS configuration.

It is concluded that the atmospheric dispersion potential of Site 5 is considerably better than Site 1C. Dispersion from Site 1C is inhibited by its relative location to the escarpment and the prevailing westerly winds. The main emission sources at Site 5 are located above the escarpment and dispersion is therefore uninhibited. This results in lower predicted ambient concentrations of all pollutants, a smaller spatial extent of the dispersed pollutants and fewer exceedances of ambient air quality guidelines for NO_2.

ACKNOWLEDGEMENTS

Atham Raghunandan of CSIR's Natural Resources and the Environment is thanked for his input on the TAPM meteorological modelling.

Richard Powell of Genesis Oil and Gas Consultants Ltd is thanked for assistance with information on the split process proposed at Site 5.

GLOSSARY OF ACRONYMS, TERMS AND UNITS

amsl	Above mea sea level
CALPUFF	The Californian Puff Model, a US-EPA approved Gaussian-Legrangian air dispersion model
CSIR	Council for Scientific and Industrial Research
EPS	Early Production System
ERM	Environmental Resources Management (Southern Africa) Pty Ltd
K	Kelvin
kg/h	Kilogram per hour
m	Meter
m/s	Meters per second
Nm^2/h	Normal meters cubed per hour
NO_2	Nitrogen dioxide
PM	Particulate matter
PM_{10}	Particulate matter with a diameter smaller than 10 µm
SO_2	Sulphur dioxide
TAPM	The Air Pollution Model – a modelling tool used to prepare surface and upper air meteorological data for input to the dispersion model, CALPUFF
$\mu g/m^3$	Micro grams per cubic meter
WHO	The World Health Organisation
WMO	World Meteorological Organisation
°C	Degrees Celsius

1 INTRODUCTION

The primary petroleum prospecting area in Uganda is the Albertine Graben. This area is located in the northernmost part of the western rift of the East Africa Rift System. The Albertine Graben stretches from the border of Sudan in the north, to Lake Edward in the south. The Government of Uganda subdivided the Ugandan part of the Graben into five petroleum exploration areas. Lake Albert is located towards the northern extremity of the Graben and is covered by Exploration Areas 1, 2 and 3A.

Tullow Oil (Tullow) and Heritage Oil have been involved in oil exploration activities in the Lake Albert area since 2003. Tullow have a Memorandum of Understanding with the Government of Uganda to develop an on-shore Early Production System (EPS), rated at 4,000 barrels per day (bpd) in the Kaiso-Tonya Valley.

Tullow has appointed Environmental Resources Management (ERM) Southern Africa (Pty) Ltd to undertake the EIA for the proposed Early Production System. Initially seven potential sites for the proposed EPS were identified. Five of these have subsequently been eliminated as viable options with Site 1C and Site 5 considered the most favorable. ERM appointed uMoya-NILU Consulting (Pty) Ltd, an air quality consulting company, to evaluate the atmospheric dispersion potential of these two sites. uMoya-NILU were also responsible for conducting the air quality specialist study for Site 1C. The focus of this report is however the comparison of dispersion potential between Sites 1C and Site 5.

2 TERMS OF REFERENCE

The terms of reference for this study are to evaluate the air pollution dispersion potential of Site 1C and Site 5 using the CALPUFF model and capitalize on the model set up and input data used in the air quality specialist study for the proposed Mputa EPS at Site 1C (uMoya-NILU, 2007).

3 METHODOLOGY

The CALPUFF dispersion model is used to simulate the dispersion of pollutants released to the atmosphere from the proposed Mputa EPS located at Site 1C and Site 5 respectively. The relative dispersion potential is evaluated by comparing the dispersion 'footprint' of predicted annual average, 24-hour maximum and 1-hour maximum ambient concentrations of sulphur dioxide (SO_2), oxides of nitrogen (NO_x) and particulate matter (PM_{10}).

The US EPA approved California Puff model (CALPUFF) is considered to be an appropriate air dispersion model for this purpose as it has the capability to simulate air pollution dispersion in complex terrain and can adequately simulate the well defined land/water interface that characterises the area surrounding proposed site. The CALPUFF model is discussed in more detail in uMoya-NILU (2007).

The two fundamental input requirements of the dispersion model are representative surface and upper air meteorology and an accurate characterisation of the emission sources and of the emissions.

3.1 Surface and upper air meteorology

Dispersion modeling ideally requires a representative set of surface and upper air data for at least one monitoring station for at least 12-months. The data should include hourly wind speed and direction, temperature, humidity, solar radiation and rainfall records. The surface meteorological data that is currently available in the area is inadequate to support dispersion modelling. The meteorological monitoring record at the proposed site and at the National Lake Rescue Institute covers a few months only while the Ugandan Meteorological Office data record at Masindi does not have the required hourly resolution and is limited to temperature, rainfall and humidity. Masindi is approximately 100 km northeast from the proposed Mputa EPS. No upper air meteorological data exists for the area.

As a result The Air Pollution Model (TAPM) is used to simulate hourly surface and upper air meteorological input data for 2005 at six locations in a 40 km by 40 km modelling domain centered on the proposed the Mputa EPS Site 1C. In so-doing hourly surface wind speed and direction, temperature, humidity, rainfall, cloud cover and solar radiation data are simulated for model input. TAPM is discussed in more detail in uMoya-NILU (2007).

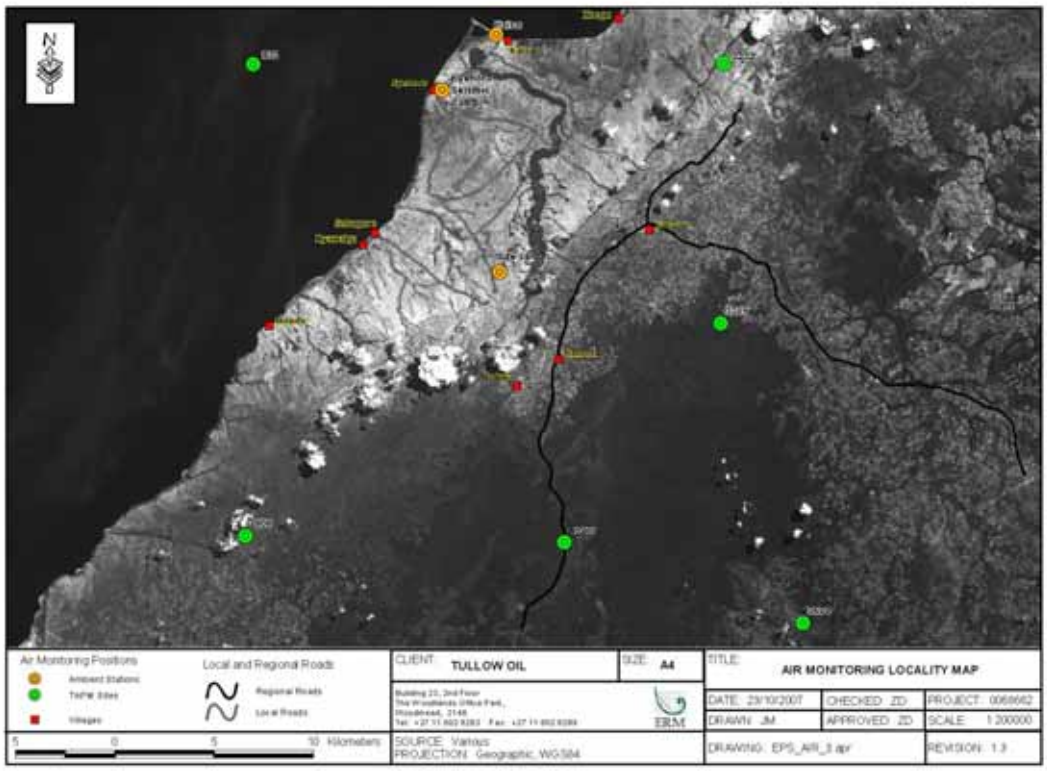


Figure 1: The selected 40 km x 40 km modelling domain showing the relative locations of the TAMP sites and the ambient air quality monitoring sites. The TAPM site numbers refer to their relative position from the modelling origin, i.e. 3219 is 32 km east and 19 km north from the bottom left corner.

3.2 Emission source characteristics

The location of Site 1C and Site 5 in the modelling domain and the location of the emission sources on the respective sites as well as the emission characteristics are important input requirements for the dispersion modelling. Data on the location of the two sites and the emission sources is available in the project documents (ERM, 2007; Genesis, 2007a).

The site layout is used to position and orientate the proposed Mputa EPS correctly in the modelling domain and to position the emission source. Data on sources and emission characteristics were made available to the air quality specialist team by the Genesis Oil and Gas Ltd process engineers via ERM (email: 10/09/2007 from Zöe Day and 05/09/2007 from Richard Powell). The proposed EPS at Site 1C is contained in an area of roughly 500m by 500m. The configuration for Site 5 is divided with some facilities in the Valley and the remainder on the top of the escarpment. The relative locations are shown in Figure 1. The plant layout is shown in Figure 2 with the split for Site 5 indicated with red and blue shading.

The emissions data used in the dispersion modelling are listed in Table 1a and 1b. No gas is available at the top site in the Site 5 option. As a result diesel is used to fire the column inlet heaters. Note the different emission rates for these two sources (Table 1b).

3.4 Key assumptions

The following assumptions are relative to this assessment:

i. The modelled TAPM surface and upper air meteorology for 2005 is representative of the meteorology of the Mputa area;
ii. The emissions data that are provided are representative of the emissions from the Mputa EPS and dispersion modelling is conducted for normal operating conditions only for point sources, i.e. emissions from diffuse source and flaring are not modelled.
iii. Emission of PM is assumed to consist entirely of PM_{10}.

3.5 Limitations and uncertainties

The following are regarded as limitations of this air quality study and therefore pose some uncertainty:

i. The lack of a long term meteorological data record for the proposed site is seen as a limitation to this study of dispersion potential. However TAPM provides good and reliable surrogate data and is appropriate for this relative study of dispersion between two sites.
ii. The assessment of emissions from the Mputa EPS under normal operating conditions from point sources only is a limitation to this study. Emissions resulting during abnormal operating conditions are typically higher than those during normal conditions. Diffuse sources can make a significant contribution to the total emission, particularly if a maintenance program is not adhered to.

iii. Not all PM emitted from the proposed Mputa EPS is PM_{10}. However, the assumption imposes an error on the safe side of the ambient air quality guideline and modelled concentrations are a 'worse case' for PM_{10}.

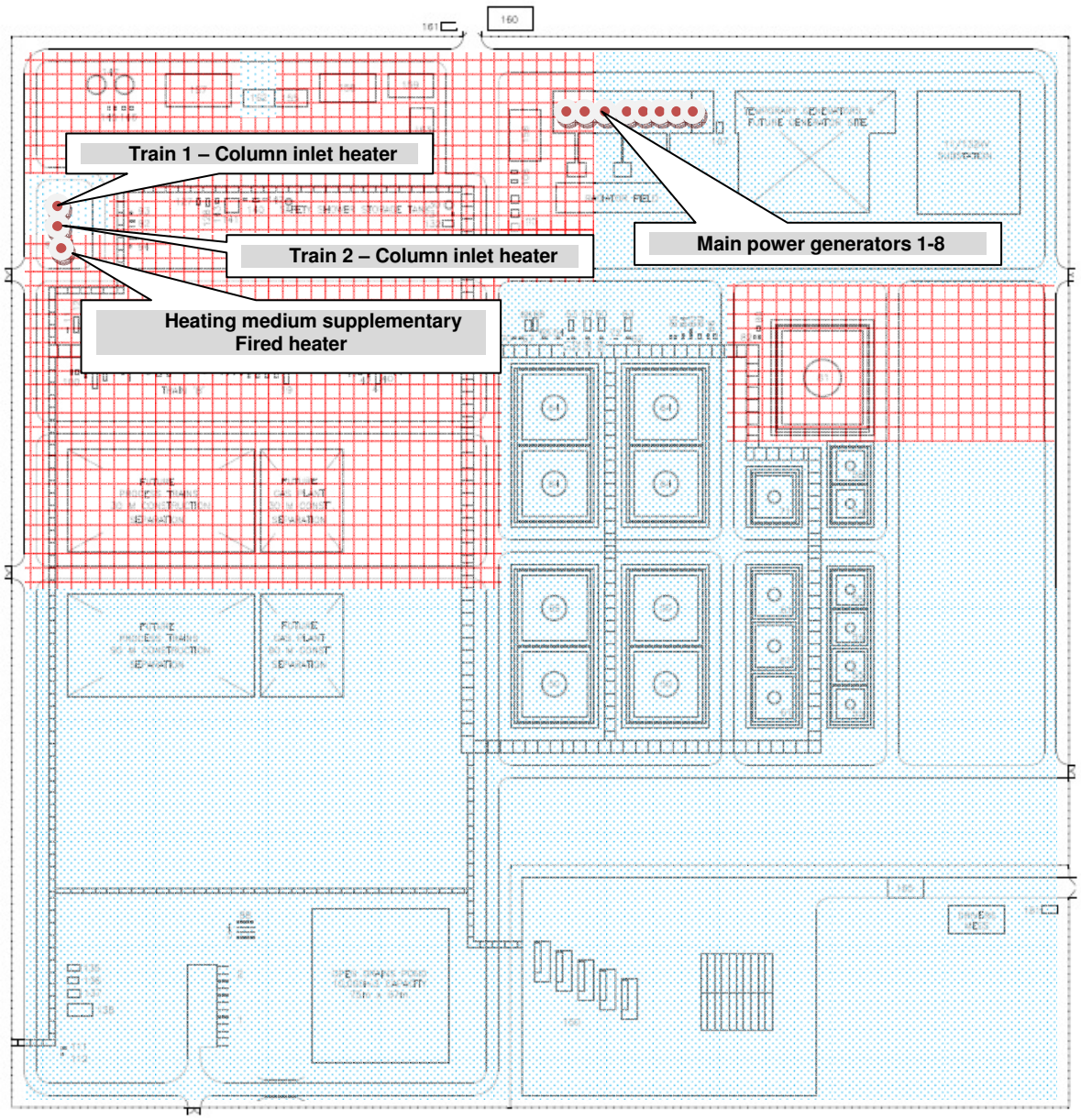


Figure 2: The layout of the proposed Mputa EPS indicating the emission points (adapted from Genesis, 2007c) and the spilt between Site 5 Valley (red hatch) and Site 5 top (blue) (pers. Comm. Richard Powell Genesis Oil and Gas Consultants Ltd.)

Table 1a: Point source characteristics of the proposed Mputa EPS at Site 1C and Site 5

TAG No.	Description	Stack height (m)	Stack diameter (m^2)	Stack base-height elevation (m)		Emission temp (K)	Emission exit velocity (m/s)	Gas flow rate (Nm^3/h)
				Site 1C	Site 5			
200-H-3211	Train 1 - Column Inlet Heater	20	0.5	752	954	650	21.22	15,000
200-H-3221	Train 2 - Column Inlet Heater	20	0.5	752	954	650	21.22	15,000
200-H-5602	Heating Medium Suppl. Fired Heater	20	0.8	752	734	500	55.26	100,000
200-A-8001-A	Main Power Generator 1 (Dual Fuel Capability)	22	1.4	753.5	735.5	413[1]	16.24	90,000
200-A-8001-B	Main Power Generator 2 (Dual Fuel Capability)	22	1.4	753.5	735.5	413[1]	16.24	90,000
200-A-8001-C	Main Power Generator 3	22	1.4	753.5	955.5	413[1]	16.24	90,000
200-A-8001-D	Main Power Generator 4	22	1.4	753.5	955.5	613	16.24	90,000
200-A-8001-E	Main Power Generator 5	22	1.4	753.5	955.5	613	16.24	90,000
200-A-8001-F	Main Power Generator 6	22	1.4	753.5	955.5	613	16.24	90,000
200-A-8001-G	Main Power Generator 7	22	1.4	753.5	955.5	613	16.24	90,000
200-A-8001-H	Main Power Generator 8	22	1.4	753.5	955.5	613	16.24	90,000

NOTE 1: 3 generators are assumed to operate with waste heart recovery units which reduces the exhaust temperature
NOTE 2: The construction platform is assumed to be 748 m amsl at Site 1C, 730 m amsl at Site 5 (Valley) and 950 m amsl at Site 5 (escarpment)

Table 1b: Emission rates for a range of pollutants in g/s for the point sources of the proposed Mputa EPS at Site 1C and Site 5. Emission rates from diesel combustions for the column inlet heaters at Site 5 are in brackets

Description	Fuel	Fuel Requirement (kg/h)	Emission Rates (g/s)					
			NO_x[1]	CO	SO_2[1]	CH_4	PM (Total)[1,2]	CO_2
Train 1 - Column Inlet Heater	Gas	114.04	0.03 (0.09)	0.05 (0.02)	0.00 (0.03)	0.00 (0.00)	0.00 (0.01)	56 (102)
Train 2 - Column Inlet Heater	Gas	114.04	0.03 (0.09)	0.05 (0.02)	0.00 (0.03)	0.00 (0.00)	0.00 (0.01)	56 (102)
Heating Medium Suppl. Fired Heater	WHRUs On Line	0.00	0.00	0.00	0.00	0.00	0.00	0
Main Power Generator 1 (Dual Fuel Capability)	Dual Fuel	1256.53	18.65	8.03	0.02	5.31	0.08	800
Main Power Generator 2 (Dual Fuel Capability)	Dual Fuel	0.00	0.00	0.00	0.00	0.00	0.00	0
Main Power Generator 3	Heavy Fuel Oil	1431.50	14.52	6.50	0.95	0.69	0.76	1,261
Main Power Generator 4	Heavy Fuel Oil	1431.50	14.52	6.50	0.95	0.69	0.76	1,261
Main Power Generator 5	Heavy Fuel Oil	1431.50	14.52	6.50	0.95	0.69	0.76	1,261
Main Power Generator 6	Heavy Fuel Oil	1431.50	14.52	6.50	0.95	0.69	0.76	1,261
Main Power Generator 7	Heavy Fuel Oil	1431.50	14.52	6.50	0.95	0.69	0.76	1,261
Main Power Generator 8	Heavy Fuel Oil	1431.50	14.52	6.50	0.95	0.69	0.76	1,261

NOTE 1: SO_2, NO_x and PM_{10} are modelled
NOTE 2: PM is assumed to be made u entirely of PM_{10}

4 LOCAL METEOROLOGY

The local meteorology of the Kaiso-Tonya Valley is discussed in some detail in uMoya-NILU (2007) and is not repeated here. Rather the wind roses at TAPM site 2408 and site 3604 that are pertinent to this assessment are presented in Figure 3.

The following should be noted with respect to the wind roses:

- The colour banding represents the following wind speed classes in m/s:
  - 1.51 – 1.80
  - 1.80 – 3.24
  - 3.34 – 5.40
  - 5.40 – 8.94
  - 8.94 -11.06
- The arcs represent frequency bands of 3%, 6%, 9%, 12% and 15%.
- Wind direction is represented from which the wind blows, e.g. westerly winds are bowing from the west.

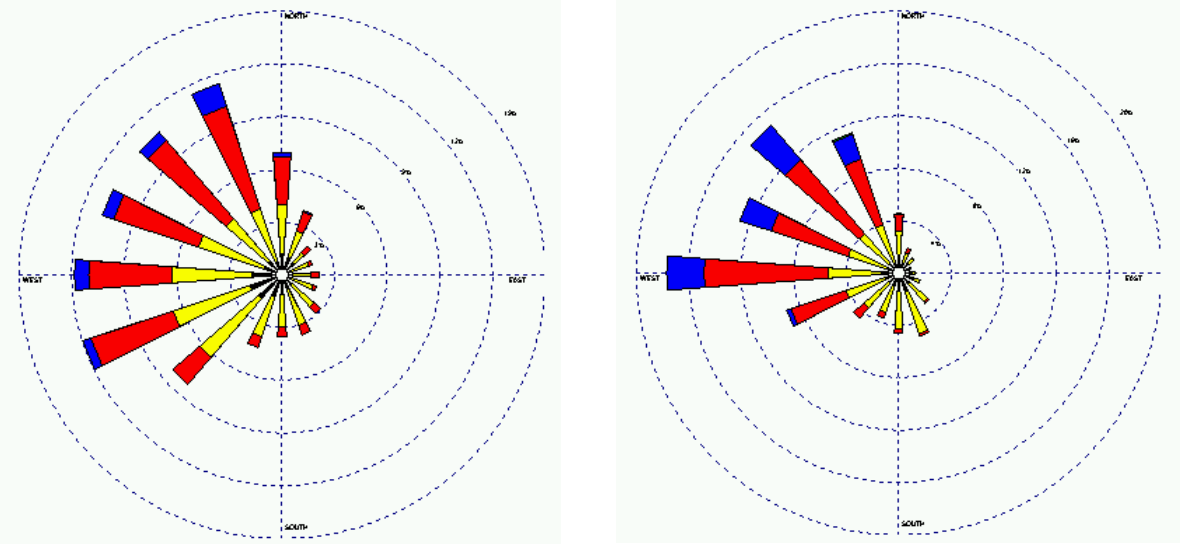


Figure 3: Wind roses for TAPM site 2408 on the lake's coastal plain and site 3604 on the escarpment. Wind speeds are in m/s and frequencies are expressed as percentages.

The dispersion potential of the atmosphere is defined as the ability of the atmosphere to disperse pollutants that are released into it. It is a function of vertical and horizontal dispersion. Vertical dispersion is mostly related to atmospheric stability with efficient dispersion associated with instability and vertical mixing. Horizontal dispersion is a function of wind speed and topography with stronger winds and flat terrain associated with efficient dispersion.

The Kaiso-Tonya Valley is located very close to the equator and therefore experiences strong solar heating throughout the year. Strong heating of the earth's surface results in good vertical mixing and efficient vertical dispersion.

The horizontal dispersion potential in the Kaiso-Tonya Valley is impeded by the high frequency of light winds (62% of all hourly wind occurrences less than 5.40 m/s) and the blocking effect of the escarpment to dispersion by the high frequency winds from the westerly sector. The light winds do not have the ability to carry the pollutants up and over the escarpment. They rather remain below the escarpment where they accumulate and spread along its face or return in an easterly direction at higher levels. This is illustrated and discussed in more detail in uMoya-NILU (2007).

5 DISPERSION MODELING RESULTS

The results of the dispersion modelling for Site 1C and Site 5 are compared for the annual average, 24-hour maximum and 1-hour maximum ambient concentrations of SO_2, NO_x and PM10 in Figures 4, 5 and 6. Note that the position of Kyehoro is incorrect in these figures, for the correct location refer to Figure 1. The predicted concentrations are represented as isopleths (lines of equal concentration) in $\mu g/m^3$. The following is relevant in terms of the isopleths diagrams:

- The annual average provides a good overview of the expected dispersion of the pollutants in the ambient environment and presents the mean dispersion pattern.
- The data contained in the annual diagrams represents the average concentration in each on the 1km by 1km modelling grid cells, i.e. the average of 8760 hourly values in each grid cell.
- Only selected isopleths have been plotted. This implies that ambient concentrations vary between isopleths and the concentrations outside of the last isopleths are below this value.
- The data contained on the 24-hour and 1-hour maximum diagrams represent the maximum predicted concentration in each modelling grid cell, i.e. the highest value of 3760 hourly values modelled in each cell. This depiction does not relate directly to the mean dispersion pattern, but provides an indication of where the maximum ambient concentration may be expected and the relevant concentrations.

The following are important observations of the predicted annual average concentration of the three pollutants and of the predicted maximum 24-hour and 1–hour concentrations:

- The predicted annual average dispersion pattern is similar for the three pollutants (Figure 4). As may be expected, the highest concentrations occur in the immediate vicinity of the emission sources in both cases. At Site 1C they occur around the proposed EPS. For Site 5 the maximum is centered on the top site, but NO_2 is shown to have two maxima, one at the Valley site and the other at the top site.
- The annual dispersion pattern for all three pollutants has an extension to the southwest of Site 1C and an even spread towards the west, decreasing with increasing distance from Site 1C.

- In all cases the predicted annual ambient concentrations are lower for emissions from Site 5 than for emissions from Site 1C. The spreading of the plume to the west over Lake Albert for Site 1C emissions as a result of accumulation of pollutants below the escarpment is not evident for emissions from Site 5.
- In neither case are the WHO annual ambient air quality guidelines exceeded (WHO, 2000; 2006).
- The predicted maximum 24-hour and 1-hour concentrations of all three pollutants resulting from emissions from Site 1C display key characteristics (Figure 5 and 6):
    - Relatively high concentrations are predicted in the vicinity of Site 1C;
    - Equally high concentrations are predicted to the east of Site 1C in a band orientated from northeast to southwest, coinciding with the face of the escarpment, i.e. impact of the plume with the higher ground to the east under the prevailing winds from the sector north-northwest to southwest.
- The predicted maximum 24-hour and 1-hour concentrations of all three pollutants resulting from emissions from Site 5 display key characteristics:
    - The highest concentrations are predicted in the vicinity of Site 5;
    - There is an even spreading of the pollutants towards the east under the prevailing winds from the north-northwest to southwest sector. There is little evidence of accumulation of pollutants below the escarpment.
- The maximum predicted 24-hour ambient concentrations of all pollutants are markedly lower for the case of emissions from the source configuration at Site 5 compared with that of Site 1C (Figure 5). For SO_2 the maximum concentrations close to the source drop from 2 to 1 µg/m^3, and for NO_2 from 50 to 30 µg/m^3 at the plant at from 40 µg/m^3 to 20 µg/m^3 on the escarpment. For PM_{10} the maximum is similar in both cases.
- In neither case are the WHO 24-hour ambient air quality guidelines exceeded (WHO, 2000; 2006).
- The maximum predicted 1-hour ambient concentrations of all pollutants are lower for the case of emissions from the source configuration at Site 5 compared with that at Site 1C (Figure 6). Points to note are:
    - For SO_2 the maximum concentration close to the source drops from more than 20 µg/m^3 at Site 1C to between 10 and 15 µg/m^3 at Site 5 (Valley). Predicted concentrations from Site 5 (top) emissions are also lower.
    - For NO_2 the predicted 1-hour maximum concentration drops from 550 to 300 µg/m^3 in the Valley and from 400 µg/m^3 to 200 µg/m^3 on the escarpment for emissions from Site 1C and Site 5 (Valley and top) respectively.
    - The maximum 1-hour concentrations of PM_{10} at the two sites is also reduced from more than 40 µg/m^3 to about 20 µg/m^3.
- The most striking feature in the comparative distribution of predicted maximum 24-hour and 1-hour concentrations from Site 1C and from Site 5 is the reduction in the spatial extent of high concentrations in the case of emissions from Site 5 (Figures 5 and 6). The extension of the plume to the west is markedly reduced as well as the dispersion to the east towards the escarpment.
- The area of predicted exceedance of the WHO 1-hour ambient air quality guideline for NO_2 (200 µg/m^3) around the proposed sites is reduced and importantly, the magnitude of the exceedances is reduced.

- The area of predicted exceedance of the WHO 1-hour ambient air quality guideline for NO_2 on the escarpment is also markedly reduced from an extensive area under emissions from Site 1C to a few isolated areas of exceedances where the predicted concentrations just reach the guideline for emissions from Site 5.

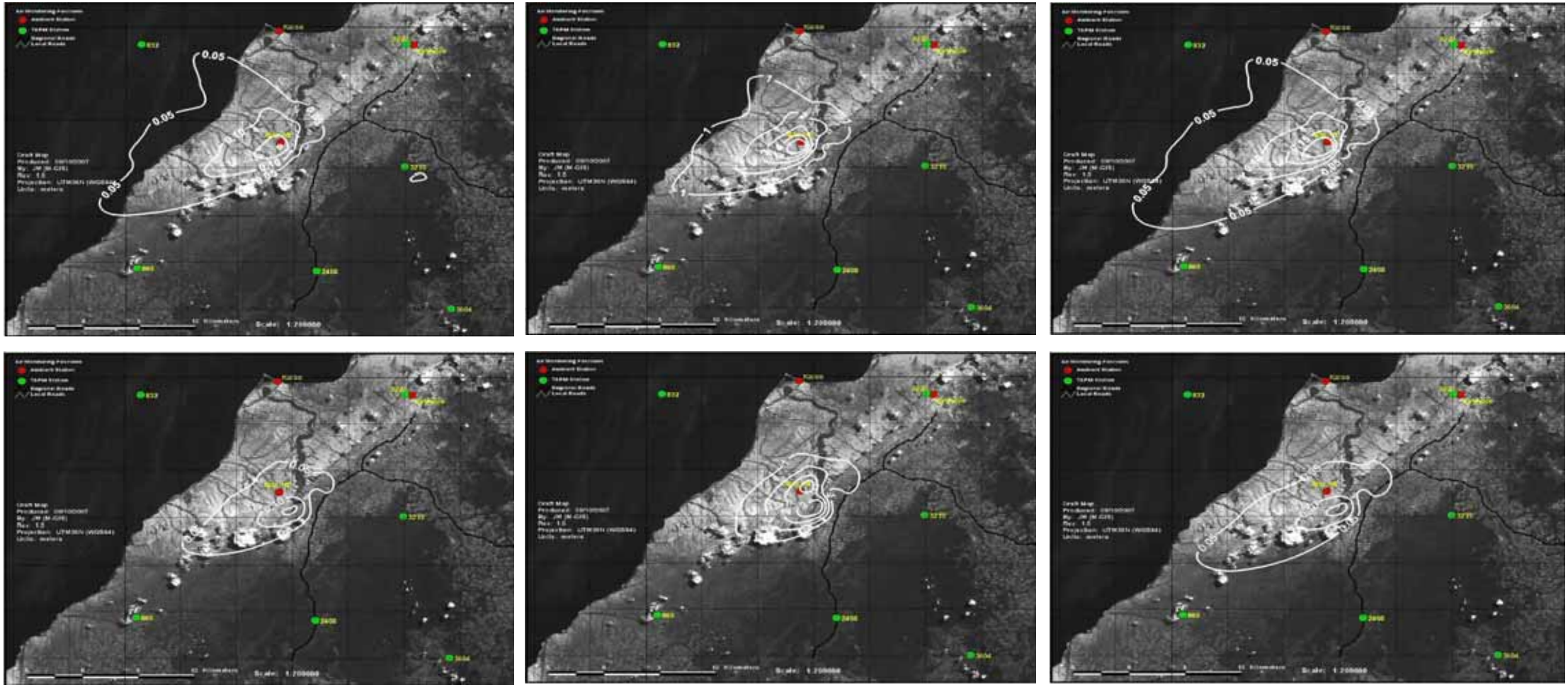


Figure 4: Predicted annual average ambient concentrations of SO_2 (left), NO_2 (middle) and PM_{10} (right) in $\mu g/m^3$ resulting from emissions from the proposed Mputa EPS at Site 1C (top) and Site 5 (bottom).

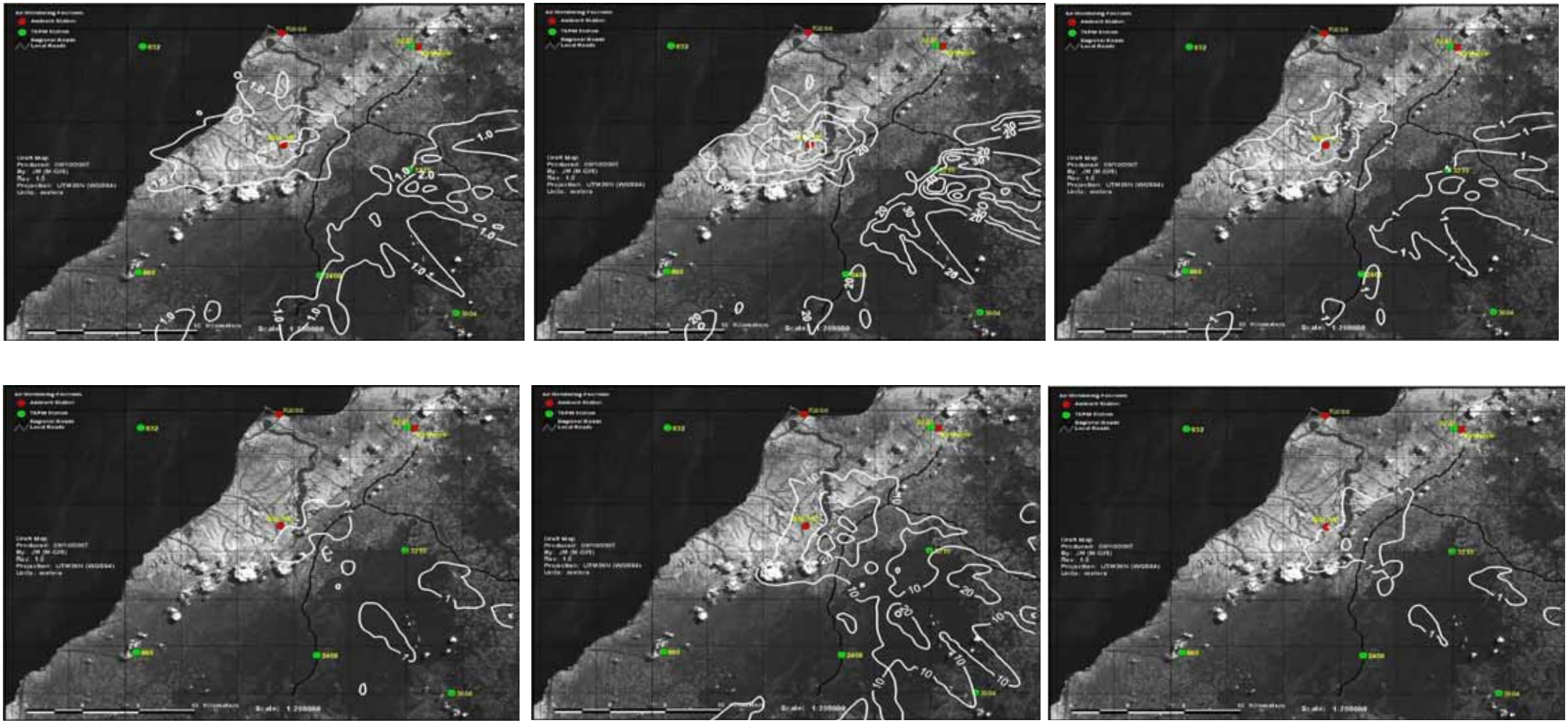


Figure 5: Predicted 24-hour maximum ambient concentrations of SO_2 (left), NO_2 (middle) and PM_{10} (right) in $\mu g/m^3$ resulting from emissions from the proposed Mputa EPS at Site 1C (top) and Site 5 (bottom).

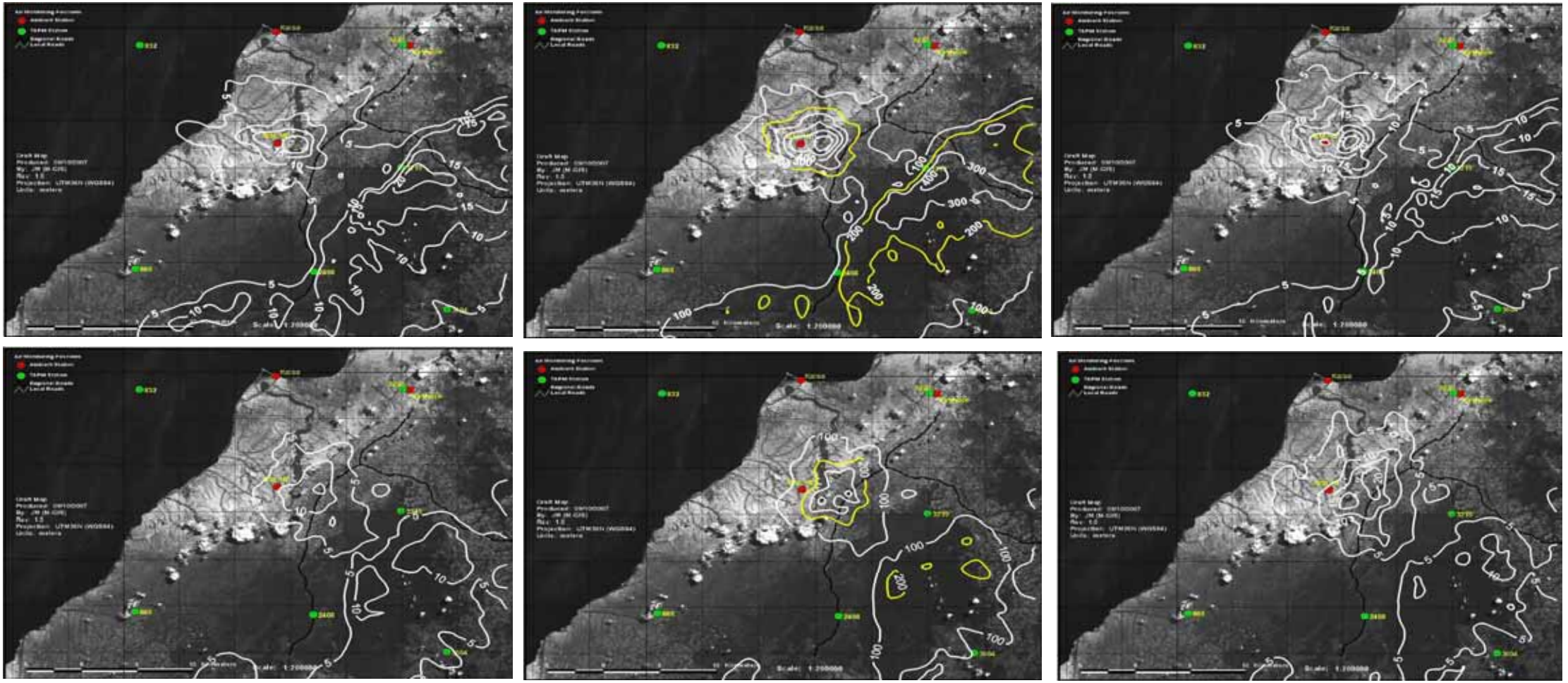


Figure 6: Predicted 1-hour maximum ambient concentrations of SO_2 (left), NO_2 (middle) and PM_{10} (right) in µg/m^3 resulting from emissions from the proposed Mputa EPS at Site 1C (top) and Site 5 (bottom). The yellow isopleths is the WHO 1-hour ambient guideline.

6 CONCLUSION

Two preferred sites have been identified in the Kaiso-Tonya Valley as suitable for the development of the proposed Mputa EPS, namely Site 1C and Site 5. Site 1C is located in the Valley to the west of the escarpment. Site 5 comprises two sections with one of the three EPS heater units located in the Valley together with two of the eight main generators and the remainder of the plant's facilities located on top of the escarpment. No gas is available at the top site and diesel is rather used in the column inlet heaters.

Dispersion modelling has been used in this study to assess the relative differences in atmospheric dispersion potential of these two sites. Atmospheric dispersion potential is the ability (or inability) of the atmosphere to disperse pollutants that are emitted into it. It is a function of vertical and horizontal dispersion. Vertical dispersion is mostly a function of atmospheric stability and horizontal dispersion is a function of wind speed and topography. The Kaiso-Tonya Valley experiences strong solar heating throughout the year which results in good vertical mixing and efficient vertical dispersion. The horizontal dispersion in the Valley is however impeded by the high frequency of light winds and the blocking effect of the escarpment to dispersion by from winds the westerly sector that do not have the ability to carry the pollutants up and over the escarpment. Pollutants with therefore tend to remain below the escarpment where they accumulate, spread and return in an easterly direction at higher levels. In order to evaluate the difference in dispersion potential between the two sites the predicted ambient concentration of sulphur dioxide (SO_2), oxides of nitrogen (NO_2) and particulate matter (PM_{10}) are compared.

The following points are noteworthy when comparing the model results of Site 1C and Site 5:

- The annual pattern of dispersion for all three pollutants has an extension to the southwest of Site 1C and an even spread towards the west, decreasing with increasing distance from Site 1C. WHO annual ambient air quality guidelines are not exceeded for either case.
- In all cases the predicted annual ambient concentrations are lower for emissions from Site 5 than for emissions from Site 1C. The spreading of the plume to the west over Lake Albert for Site 1C emissions as a result of accumulation of pollutants below the escarpment is not evident for emissions from Site 5.
- The predicted maximum 24-hour and 1-hour concentrations of all three pollutants from emissions from Site 1C result in relatively high concentrations in the immediate vicinity of the EPS and equally high concentrations to the east of Site 1C in a band orientated from northeast to southwest, coinciding with the face of the escarpment, i.e. impact of the plume with the higher ground to the east under the prevailing winds from the sector north-northwest to southwest.
- The highest predicted maximum 24-hour and 1-hour concentrations of all three pollutants resulting from emissions from Site 5 are predicted in the immediate vicinity of the EPS sources. There is an even spreading of the pollutants towards the east under the prevailing westerly winds and there is little evidence of an accumulation of pollutants against the escarpment.
- The maximum predicted 24-hour and 1-hour ambient concentrations of all pollutants are markedly lower for the case of emissions from Site 5 compared with Site 1C.

- In neither case is the WHO 24-hour ambient air quality guidelines exceeded, nor is the 1-hour guideline for SO_2 and PM_{10}.
- The WHO 1-hour guideline is exceeded for predicted NO_2 concentration for emissions from both sites. However, the predicted 1-hour maximum concentration drops from 550 to 300 µg/m^3 in the Valley and from 400 to 200 µg/m^3 on the escarpment for Site 1C and Site 5 emissions respectively. The reduction in the spatial extent of the predicted high concentrations in the case of emissions from Site 5 is also marked.

It is concluded that the atmospheric dispersion potential of Site 5 is considerably better than Site 1C. Dispersion from Site 1C is inhibited by its relative location to the escarpment and the prevailing westerly winds. The main emissions sources at Site 5 are located above the escarpment and the dispersion is therefore uninhibited, resulting in lower predicted ambient concentrations of all pollutants, a smaller spatial extent of the dispersed pollutants and fewer exceedances of ambient air quality guidelines for NO_2.

REFERENCES

ERM, (2007): Background Information Document, Environmental Impact Assessment for the Proposed Early Production System, Lake Albert, Exploration Area 2, Uganda, July, 2007, 10pp.

Genesis, (2007a): Basis of Design for the Mputa Early Production System, Genesis Job J-07541 for Tullow Group Services Limited.

Genesis, (2007b): Functional Specification for the Mputa Early Production System, Genesis Job J-07541 for Tullow Group Services Limited.

Genesis, (2007c): Mputa Early Production System Plot Plan Central Processing Facility, Project No. J7541A, Drawing No. P-DW-041, Rev. B1.

uMoya-NILU (2007): *Air quality assessment for the proposed Mputa Early Production System at Site 1B, Lake Albert, Uganda*, report for Environmental Resource Management Southern Africa (ERM), uMoya-NILU Consulting (Pty) Ltd, Report No. uMN001-07.

WHO, (2000): Air Quality Guidelines for Europe, 2nd Edition, World Health Organisation, ISBN 92 890 1358 3.

WHO, (2006): WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide, Global update 2005, Summary of risk assessment, WHO/SDE/PHE/OEH/06.02.

ZHL, (2007): Environmental design premise for exploration operations in Lake Albert, Uganda, ZLH 2141/RPT/001 Rev A, 25 May 2007.

Annex I

Environmental Baseline Data

I1.1 *HYDROLOGY AND RIVER CATCHMENTS*

Figure 1.1 *Rivers and River Catchments*

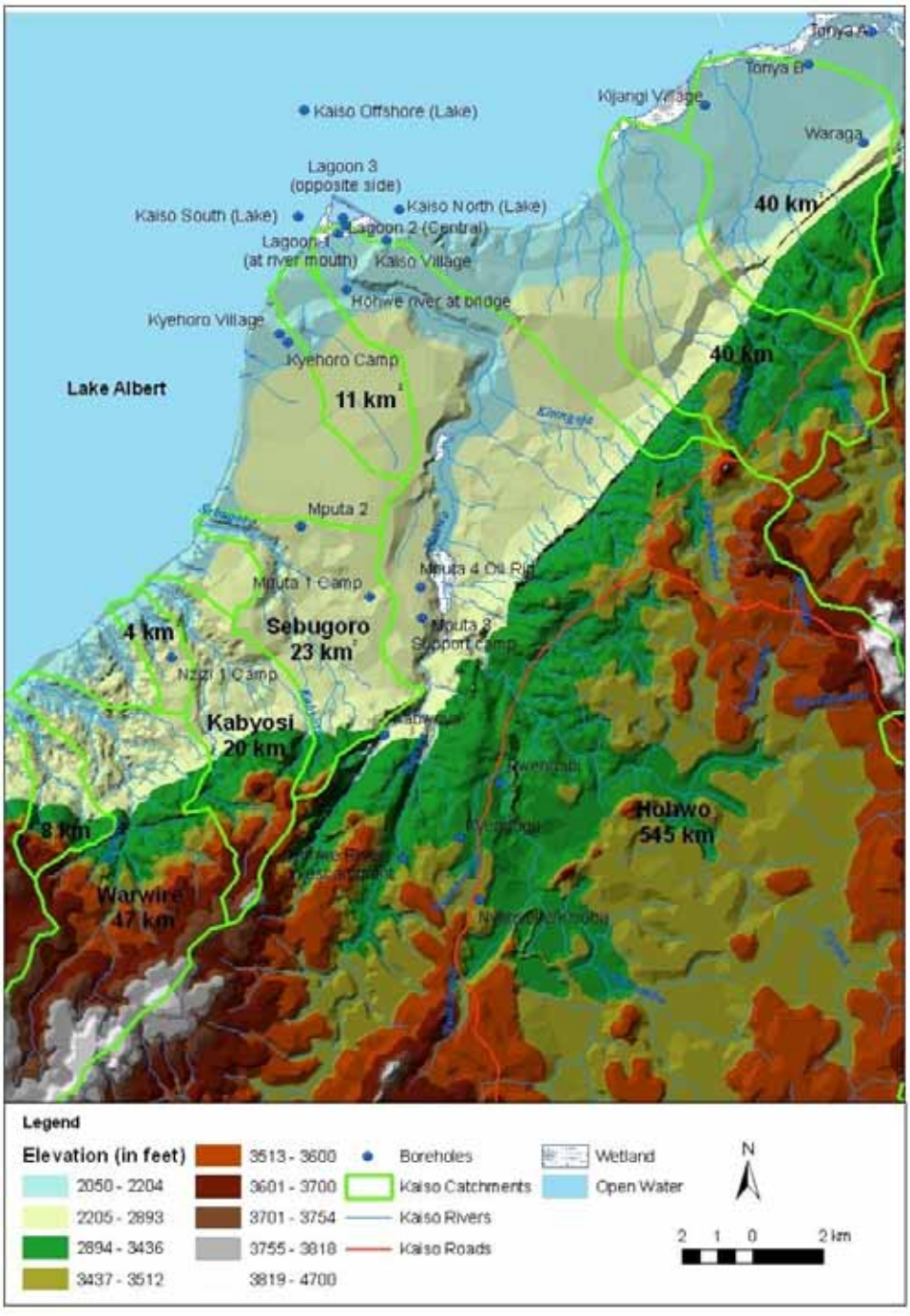
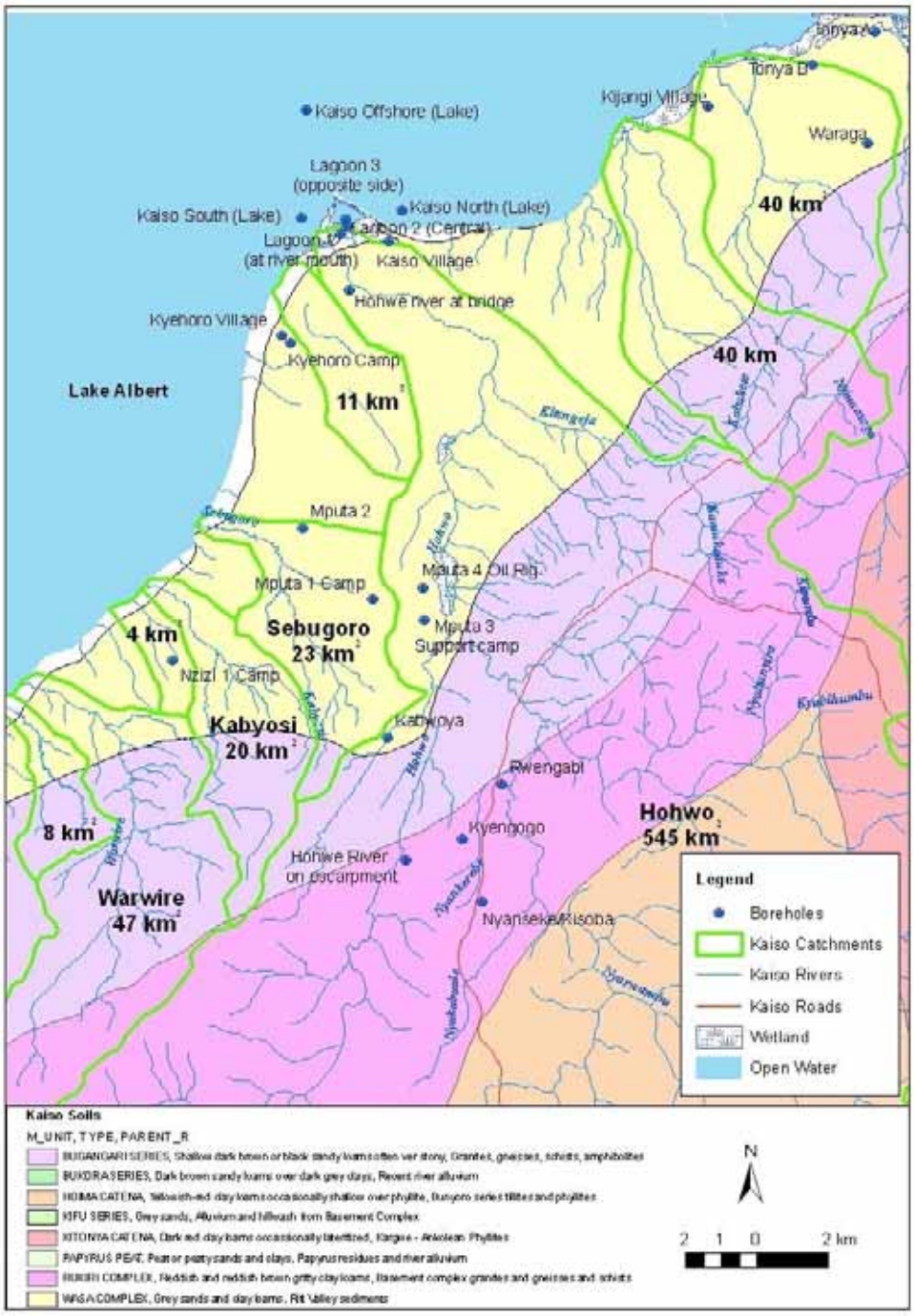


Figure 1.2 River Catchments and Soil Map



I1.2 SEDIMENT AND WATER QUALITY BASELINE INFORMATION

I1.2.1 Sampling Locations

Figure 1.3 Sampling Locations

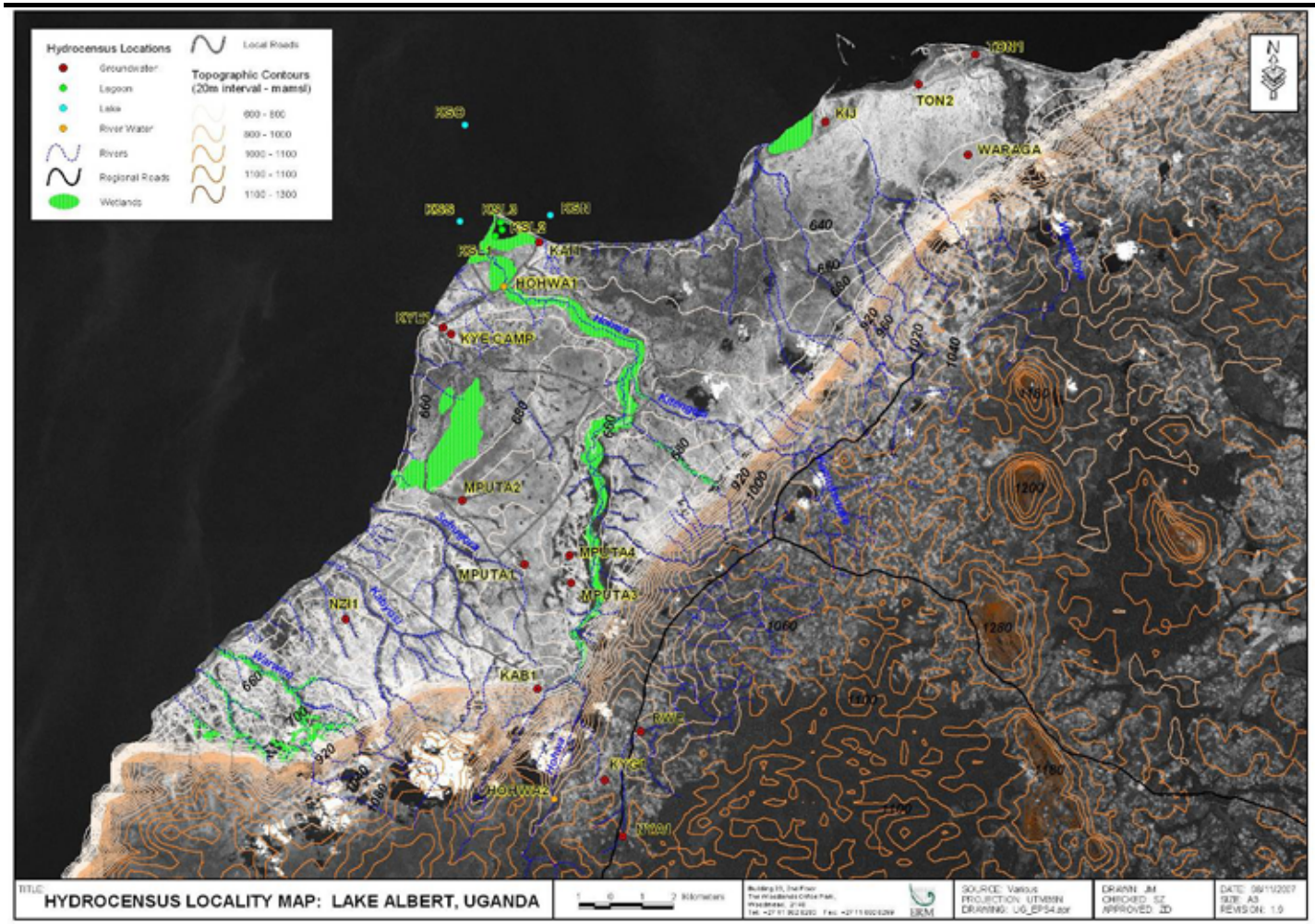


Table 1.1 Hydrocensus locations and laboratory schedule

Borehole ID	Sample ID	Longitude (E)	Latitude (N)	Elevation [mamsl]	Location	Site type	Site status	Inorganic	Metals	VOCs	Stable Isotopes	Tritium/ 14C
DWD216599	Nzi1	030.91253	01.42422	677	Nzizi Camp	BH	used	X	X	X	X	-
DCL2290	n.a.	030.94237	01.50538	656	Kyehoro Camp	BH	used	-	-	-	-	-
n.a.	Mputa1	030.96327	01.43993	724	Mputa 1 Camp	BH	used	X	X	X	X	-
DCL21654	n.a.	030.94557	01.45817	687	Mputa 2	BH	used	-	-	-	-	-
DWD21643	n.a.	030.97651	01.43464	725	Mputa 3 support camp	BH	used	-	-	-	-	-
DWD21645	Mputa4	030.97603	01.44253	718	Mputa 4 Oil Exploration	BH	used	X	X	X	X	-
DCL2292	n.a.	031.08873	01.55679	638	Waraga, Exploration Site II	BH	unused	-	-	-	-	-
DWD 21656	Kye1	030.94009	01.50739	631	Kyehoro Village	BH	used	X	X	X	X	-
n.a.	Kai1	030.96730	01.53161	621	Kaiso Village	BH	unused	X	X	X	-	-
n.a.	n.a.	031.04833	01.56617	630	Kijangi	BH	unused	-	-	-	-	-
DWD12657	Ton1	031.09082	01.58536	617	Tonya A	BH	used	X	X	X	X	-
n.a.	Ton2	031.07467	01.57681	618	Tonya B	BH	unused	X	-	X	-	-
225481	Kab1	030.96696	01.40440	816	Foothill of escarpment	BH	used	X	X	X	X	-
DWD12705	Kyg1	030.98612	01.37836	1041	Kyengogo	BH	used	X	X	X	X	X
n.a.	Nya1	030.99113	01.36242	1063	Nyanseke/Kisoba	BH	used	X	X	X	X	-
n.a.	n.a.	030.99620	01.39239	1006	Rwengabi	BH	used	-	-	-	-	-

NOTES:

ID	Identification
n.a.	Not available
X	analysed
-	not analysed
mamsl	meters above mean sea level
BH	Borehole

Table 1.2 Field Parameters Measured during Groundwater Sampling (September 2007)

Parameter	Kab1	Mputa1	Mputa4	Nzi1	Nya1	RWE	Kyg1	Kai1	Kye1	Ton1	Ton2
Location	Valley				Escarpment			Lakeside			
pH	**6.4**	**6.4**	**6.4**	6.6	**6.1**	6.5	6.6	6.7	7.0	6.9	7.1
EC (mS/m)	137	50	38	61	21	54	60	130	75	200	87
T (^{0}C)	28.8	30.2	27.9	27.8	24.5	25.6	28.7	28.5	29.8	29.6	30.8
DO (mg/L)	1.5	2.0	0.86	4.8	3.3	3.3	3.3	n.m.[1]	7.5	n.m.[1]	n.m.[1]

[1] = no measurement taken

Bold = Concentrations that exceed the guidance value are given in bold

Table 1.3 Field Parameters Measured during Surface Water Sampling (May 2007 and September 2007)

Parameter	Hohwa1	Hohwa2	KSL1	KSL2	KSL3	KSS1	KSS2	KSN1	KSN2	KSO1	KSO2
Location	River		Lagoon			Lake					
pH	6.7	7.0	7.6 - 7.9	7.6 - 7.9	7.6 - 7.9	7.9	7.9	8.3	8.2	7.9	7.9
EC (mS/m)	19	19	60 - 61	60 - 61	60 - 61	71	71	71	72	71	71
TEMP (^{0}C)	24.2	20.5	30– 31	30– 31	30– 31	28.2	28.0	28.4	28.2	28.8	28.0
DO (mg/L)	n.m[1]	7.0	4.5 - 5.6	4.5 - 5.6	4.5 - 5.6	4.4	4.0	4.7	2.2	8.0	3.3

Hohwa1, Hohwa2 = readings taken during September 2007 hydrocensus

KSL1-KSL3 = ranges for lagoon reported in NaFIRRI report (2007)

KSS1 – KSO2 = values read from water quality graphs in NaFIRRI report (2007)

[1] = no measurement taken

Table 1.4 Major Ions and Nutrients in Groundwater – mg/L

Parameter	UNBS[1]	Kab1	Mputa1	Mputa4	Nzi1	Nya1	Kyg1	Kai1	Kye1	Ton1	Ton2
Location		K-T Valley				Escarpment		Lakeshore			
Na^+	200	54	26	19	155	11	160	140	41	**440**	160
K^+	N[2]	6.0	5.0	4.4	4.3	3.0	4.2	140	5.4	6.8	17
Ca^{2+}	75	**110**	41	34	5.2	20	37	25	8.4	8.2	n.m.[3]
Mg^{2+}	50	**88**	18	17	1.7	9.8	38	15	2.6	9.3	n.m.[3]
F^-	1	**1.8**	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	0.9
Cl^-	250	51	15	5	7	<1	26	180	2	**320**	94
SO_4^{2-}	200	**350**	55	32	13	9	<3	64	45	51	25
PO_4^-	n.a.[2]	<0.08	<0.08	<0.08	0.93	<0.08	4.0	6.0	<0.08	2.1	6.9
NO_3^-	10	<0.3	<0.3	<0.3	0.5	0.6	0.4	**130**	4.3	1.3	1.7
NH_4^-	n.a.[2]	<0.2	0.3	0.3	1.8	<0.2	6.8	<0.2	<0.2	2.2	2.8
Total Phos	n.a.[2]	0.17	0.48	0.50	0.56	0.35	1.70	2.50	0.43	1.30	4.80
Tot. Alk[4]	500	360	260	130	325	110	360	170	310	450	180
Car. Alk[4]	n.a.[2]	<2	<2	<2	50	<2	<2	<2	<2	20	<2
Bic. Alk[4]	n.a.[2]	360	260	130	260	110	360	170	310	430	180
DOC	n.a.[2]	3	1	2	2.50	<1	13	4	2	8	12

[1] = Ugandan National Bureau of Standards – drinking water

[2] = No UNBS or WHO guidance value developed

[3] = Not measured

[4] = Total Alkalinity, Carbonate Alkalinity and Bicarbonate Alkalinity given in CaCO3 Equivalents

Bold = Concentrations that exceed the guidance value are given in bold

Table 1.5 Major Ions and Nutrients in Surface Water– mg/L

Parameter	UNBS[1]	Hohwa1	Hohwa2	KSL1	KSL2	KSL3	KSS1	KSS2	KSN1	KSN2	KSO1	KSO2
Location		River		Lagoon			Lake					
Na^+	200	11	14	59	59	60	68	68	68	68	68	68
K^+	n.a.[2]	5.6	5.6	37.0	37.0	36.0	50.0	50.0	50.0	50.0	50.0	9.5
Ca^{2+}	75	19	15	23	23	23	9.9	9.0	9.5	10	9.6	10
Mg^{2+}	50	9.3	9.2	18	17	18	26	28	29	27	26	27
F^-	1	<0.5	<0.5	0.7	0.7	0.8	**1.0**	0.9	0.9	0.9	0.8	0.9
Cl^-	250	5	3	20	20	20	22	22	22	21	22	22
SO_4^{2-}	200	4	5	10	10	10	15	15	15	15	16	14
PO_4^-	n.a.[2]	0.64	0.78	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
NO3	10	<0.3	1.3	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
NH4	n.a.[2]	<0.2	<0.2	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
TP	n.a.[2]	0.580	0.750	0.610	0.540	0.550	0.029	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
Tot. Alk[5]	n.a.[2]	110	120	196[4]	194[4]	197[4]	221[4]	225[4]	227[4]	227[4]	225[4]	220[4]
Car. Alk[5]	n.a.[2]	<2	<2	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
Bic. Alk[5]	n.a.[2]	110	120	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
COD	n.a.[2]	38	47	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]	n.m.[3]
DOC	n.a.[2]	12	16	20	17	18	6	7	6	7	7	7

[1] = Ugandan National Bureau of Standards – drinking water
[2] = No UNBS or WHO guidance value developed
[3] = not measured
[4] = Estimated value, determined by subtracting sum of anions (meq/L) from sum of cations (meq/L)
[5] = Total Alkalinity, Carbonate Alkalinity and Bicarbonate Alkalinity given in $CaCO_3$ equivalents

Table 1.6 Dissolved Trace Metals in Groundwater – µg/L

Parameter	UNBS[1]/ WHO[2]	Kab1	Mputa1	Mputa4	Nzi1	Nya1	Kyg1	Kai1	Kye1	Ton1
Location		K-T Valley				Escarpment		Lakeshore		
Al	100	6	6	7	13	11	6	9	11	7
As	50	<1	<1	<1	4	<1	<1	<1	2	<1
B	500[2]	28	34	34	120	27	38	110	38	190
Cd	10	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Cr^3	50[2]	2	<1	<1	1	1	<1	<1	<1	<1
Cu	1 000	1	<1	4	2	3	4	5	3	9
Fe	300	**19 000**	**1300**	**910**	110	**1400**	**440**	27	**450**	230
Pb	50	3	<1	<1	<1	<1	<1	<1	<1	<1
Mn	100	**160**	96	**770**	46	49	11	55	90	15
Ni	20[2]	2	<1	<1	<1	<1	<1	<1	<1	<1
Se	10[2]	<1	<1	<1	<1	<1	2	5	1	<1
U	15[2]	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zn	5 000	**6 400**	33	51	14	86	35	21	21	180
Hg	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

[1] = Ugandan National Bureau of Standards – drinking water
[2] = World Heath Organisation drinking water quality guideline
[3] = Chromium as Cr^{6+}
Bold = Concentrations that exceed the guidance value is given in bold

Table 1.7 Dissolved Trace Metals in Surface Water - µg/L

Parameter	UNBS[1]/ WHO[2]	Hohwa1	Hohwa2
Al	100	18	37
As	50	<1	<1
B	500[2]	40	28
Cd	10	<0.4	<0.4
Cr[3]	50[2]	2	<1
Cu	1 000	9	3
Fe	300	**310**	**610**
Pb	50	<1	<1
Mn	100	28	24
Ni	20[2]	4	3
Se	10[2]	<1	<1
U	15[2]	<1	<1
Zn	5 000	12	13
Hg	1	<0.05	<0.05

[1] = Ugandan National Bureau of Standards – drinking water
[2] = World Heath Organisation drinking water quality guideline
[3] = Chromium as Cr^{6+}
Bold = Concentrations that exceed the guidance value are given in bold

I1.2.3 Additional Water Quality Baseline – October 2007

Table 1.8 Coordinates of Surface Water Sample Locations

Sample	Latitude	Longitude	Description
Hohwa 1	1.51905° N	30.95755° E	Northern bank of moderately flowing river, up gradient of bridge
Hohwa 2	1.37297° N	30.97180° E	Eastern bank of moderately flowing river, up gradient of clothing washers

Table 1.9 Field Parameters Measured during Surface Water Sampling

Parameter	Hohwa1		Hohwa2	
	4 Sept 07	11 Oct 07	4 Sept 07	11 Oct 07
Description	Light brown discolouration		Light brown discolouration	
pH	6.7	7.0	7.0	8.3
EC (mS/m)	19	18	19	21
DO (mg/L)	n.m	n.m	7.0	n.m
Temp (^{0}C)	24.2	23.6	20.5	20.1
ORP (mV)	n.m	58	n.m	79

n.m. = not measured
EC = Electrical Conductivity (mS/m)
T = Temperature in degrees Celsius
ORP = Reduction/Oxidation Potential (mV)
DO = Dissolved oxygen

Table 1.10 Major ion chemistry of surface water samples

Parameter	Units	UNBS[1]	Hohwa1		Hohwa2	
			4 Sept 07	11 Oct 07	4 Sept 07	11 Oct 07
Na^+	mg/L	200	11	9.9	14	19
K^+	mg/L	N[2]	5.6	5.6	5.6	5.4
Ca^{2+}	mg/L	75	19	17	15	18
Mg^{2+}	mg/L	50	9.3	8.2	9.2	11
F^-	mg/L	1	<0.5	n.m.[3]	<0.5	n.m.[3]
Cl^-	mg/L	250	5	5	3	3
SO_4^{2-}	mg/L	200	4	<3	5	<3

Parameter	Units	UNBS[1]	Hohwa1		Hohwa2	
PO_4^-	mg/L	N[2]	0.64	n.m.[3]	0.78	n.m.[3]
NO_3	mg/L	10	<0.3	n.m.[3]	1.3	n.m.[3]
NH_4	mg/L	N[2]	<0.2	n.m.[3]	<0.2	n.m.[3]
Total Phosphorus	mg/L	N[2]	0.580	n.m.[3]	0.750	n.m.[3]
Total Alkalinity[4]	mg/L as $CaCO_3$	N[2]	110	n.m.[3]	120	n.m.[3]
Carbonate Alkalinity[4]	mg/L as $CaCO_3$	N[2]	<2	n.m.[3]	<2	n.m.[3]
Bicarbonate Alkalinity[4]	mg/L as $CaCO_3$	N[2]	110	80	120	100
COD	mg/L	N[2]	38	n.m.[3]	47	n.m.[3]
DOC	mg/L	N[2]	12	n.m.[3]	16	n.m.[3]

[1] = Ugandan National Bureau of Standards – drinking water
[2] = No UNBS or WHO guidance value developed
[3] = Not measured
[4] = Total Alkalinity, Carbonate Alkalinity and Bicarbonate Alkalinity given in $CaCO_3$ equivalents
Bold = Concentrations that exceed the guidance value are given in bold

Table 1.11 Trace element chemistry of surface water samples

Parameter	Units	UNBS[1]/ WHO[2]	Hohwa1		Hohwa2	
			4 Sept 07	11 Oct 07	4 Sept 07	11 Oct 07
Al	µg/L	100	18	n.m.[4]	37	n.m.[4]
As	µg/L	50	<1	30	<1	<1
B	µg/L	NV/500	40	n.m.[4]	28	n.m.[4]
Cd	µg/L	10	<0.4	<0.4	<0.4	<0.4
Co	µg/L	NV/NV	n.m.[4]	<1	n.m.[4]	<1
Cr[3]	µg/L	50[2]	2	<1	<1	<1
Cu	µg/L	1 000	9	7	3	10
Fe	µg/L	**300**	**310**	n.m.[4]	**610**	n.m.[4]
Pb	µg/L	50	<1	2	<1	<1
Mn	µg/L	100	28	n.m.[4]	24	n.m.[4]
Ni	µg/L	NV/20	4	3	3	2
Se	µg/L	NV/10	<1	n.m.[4]	<1	n.m.[4]
U	µg/L	NV/15	<1	n.m.[4]	<1	n.m.[4]
V	µg/L	NV/NV		3	n.m.[4]	4
Zn	µg/L	5 000	12	59	13	49.5
Hg	µg/L	1	<0.05	<0.05	<0.05	<0.05

[1] = Ugandan National Bureau of Standards – drinking water
[2] = World Heath Organisation drinking water quality guideline
[3] = Chromium as Cr^{6+}
[4] = Not measured
Bold = Concentrations that exceed the guidance value are given in bold

I1.2.4 Water Quality Baseline Collected during Invertebrate Study – October

Table 1.12 Water Quality Baseline data from Hohwa River Sites

Variables	Sites					
	1	2	3	4	5	Ngasa lagoon
A: Physical						
Cond. (µs/cm)	196	233	185	195	283	
Temp (°C)	23.6	20.1	23.5	23.9	23.2	
pH	7.0	8.3	7.6	7.8	8.0	
ORP (mV)	58.0	79.0	91.0	83.0	57.0	
B: Nutrients						
TP (µg/L)	340.3	356.1	320.8	271.1	429.8	540
TDP (µg/L)	275.3	315.7	279.5	259.1	301.8	

SRP (µg/L)	240.7	281.6	239.1	184.9	287.6	
TN (µg/L)	3804.8	3347.5	3666	3780.2	3678.0	1720
TDN (µg/L)	552.0	722.7	697.7	558.3	620.7	
$N0_3$-N (µg/L)	30.3	37.1	25.7	21.4	31.7	
C: Other						
Chl-a (µg/L)	0.4	0.8	0.3	0.5	0.4	29
TSS (µg/L)	1075.0	3562.5	1937.5	1787.5	2300.0	18

I1.2.5 Sediment Quality Baseline – September 2007

Table 1.13 Trace Metals in Lagoon Sediments - mg/kg

Parameter	NOAA[1]	KSL1 A1	KSL1 A2	KSL1 B1	KSL1 B2	KSL2 A1	KSL2 A2	KSL2 B1	KSL2 B2	KSL3 A1	KSL3 A2	KSL3 B1	KSL3 B2
Co	n.a.[2]	20	21	20	20	22	22	21	21	21	20	20	20
Cu	36	25	23	22	22	24	31	29	24	24	24	23	25
Ni	18	**33**	**34**	**32**	**33**	**35**	**35**	**36**	**36**	**33**	**32**	**35**	**34**
V	n.a.[2]	62	66	66	66	70	72	72	71	71	70	73	70
Hg	0.174	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects

[2] = No NOAA guidance value developed

Table 1.14 Trace Metals in Lake Albert Sediments - mg/kg

Parameter	NOAA[1]	KSS A1	KSS A2	KSS B1	KSS B2	KSN A1	KSN A2	KSN B1	KSN B2	KSO A1	KSO A2	KSO B1	KSO B2
Co	n.a.[2]	17	17	16	17	15	15	14	14	19	19	18	18
Cu	36	14	11	<6	<6	15	16	17	20	30	29	26	37
Ni	18	8	8	7	7	**22**	**22**	**19**	**19**	**32**	**32**	**29**	**33**
V	n.a.[2]	19	20	17	17	48	48	37	40	59	59	61	61
Hg	0.174	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects

[2] = No NOAA guidance value developed

Table 1.15 Petroleum Hydrocarbons and Organic Matter in Lagoon Sediments - mg/kg

Parameter	NOAA[1]	KSL1 A1	KSL1 A2	KSL1 B1	KSL1 B2	KSL2 A1	KSL2 A2	KSL2 B1	KSL2 B2	KSL3 A1	KSL3 A2	KSL3 B1	KSL3 B2
Naphthalene	0.5	**4.900**	**4.100**	**3.000**	**3.300**	**2.600**	**4.200**	**2.200**	**1.900**	**2.600**	**2.300**	**2.700**	**2.200**
Acenapthene	0.15	**1.400**	**0.970**	**0.740**	**0.880**	**0.720**	**1.200**	**0.620**	**0.510**	**0.590**	**0.640**	**0.760**	**0.600**
Flourene	0.35	**0.960**	**0.610**	**0.520**	**0.630**	**0.570**	**0.900**	**0.440**	**0.360**	**0.390**	**0.460**	**0.610**	**0.430**
Phenanthrene	0.26	**0.640**	**0.370**	**0.350**	**0.410**	**0.400**	**0.550**	**0.310**	**0.260**	**0.270**	**0.330**	**0.870**	**0.310**
Anthacene	0.30	0.083	0.050	0.043	0.048	0.042	0.070	0.040	0.033	0.036	0.043	0.200	0.041
Flouranthene	1.00	0.037	0.036	0.036	0.038	0.039	0.049	0.034	0.031	0.031	0.042	0.340	0.037
T - PAH[2]	1.00	**8.100**	**6.200**	**4.700**	**5.400**	**4.400**	**7.000**	**3.600**	**3.100**	**3.900**	**3.900**	**5.900**	**3.600**
EPH[3]	n.a.[5]	590	680	790	840	1400	1100	1700	1600	1200	1200	1600	1400
OM[4]	n.a[5]	130	130	140	140	150	150	160	160	170	180	180	190

[1] = National Oceanic and Atmospheric Administration (NOAA) threshold concentrations for toxic effects – Long & Morgan, 1990.

[2] = Total Polycyclic Aromatic Hydrocarbons

[3] = Extractable Petroleum Hydrocarbons (C_{10} – C_{40})

[4] = Organic matter

[5] = No Value developed

Table 1.16 Petroleum Hydrocarbons and Organic Matter in Lake Albert Sediments - mg/kg

Parameter	NOAA[1]	KSS A1	KSS A2	KSS B1	KSS B2	KSN A1	KSN A2	KSN B1	KSN B2	KSO A1	KSO A2	KSO B1	KSO B2
Naphthalene	**0.5**	0.053	0.093	0.061	0.085	**4.400**	**5.000**	0.190	0.110	0.140	0.150	0.200	0.055
Acenapthene	**0.15**	<0.02	<0.02	0.017	0.023	**0.810**	**0.940**	0.059	0.029	0.042	0.052	0.063	<0.02
Flourene	**0.35**	0.016	0.020	0.024	0.028	**0.440**	**0.530**	0.039	0.019	0.041	0.058	0.055	0.029
Phenanthrene	**0.26**	0.035	0.034	0.033	0.037	0.250	**0.290**	0.051	0.036	0.041	0.058	0.062	0.110
Anthacene	0.30	<0.01	<0.01	<0.01	<0.01	0.031	0.036	<0.01	<0.01	<0.01	<0.01	<0.01	0.027
Flouranthene	1.00	0.035	<0.03	<0.03	<0.03	0.025	0.029	<0.03	<0.03	<0.03	<0.03	<0.03	0.100
T - PAH[2]	**1.00**	0.270	0.160	0.150	0.200	**6.000**	**6.800**	0.360	0.210	0.320	0.340	0.410	0.630
EPH[3]	n.a.[5]	170	180	160	170	360	320	200	220	290	310	340	340
OM[4]	n.a.[5]	15	17	12	13	44	43	34	34	57	58	67	60

[1] = National Oceanic and Atmospheric Administration (NOAA) threshold concentrations for toxic effects – Long & Morgan, 1990.
[2] = Total Polycyclic Aromatic Hydrocarbons
[3] = Extractable Petroleum Hydrocarbons (C_{10} – C_{40})
[4] = Organic matter
[5] = No Value developed

I1.2.6 Additional Sediment Quality Baseline – October 2007

Table 1.17 Coordinates of Sediment Sampling Locations

Sample	Latitude	Longitude	Location	Description
Hohwa 2	1.37297° N	30.97180° E	0 km downstream of Hohwa 2. On escarpment. Duplicates position from September 2007 surface and groundwater sampling	Eastern bank of moderately flowing river, up gradient of clothing washers, approximately 30 cm below the water surface.
Hohwa 5	1.42064° N	30.97865° E	5.4 km downstream of Hohwa 2. Just below escarpment, immediately downstream of proposed production site and upstream of wetland area.	Western bank of strongly flowing river, approximately 30 cm below the water surface
Hohwa 4	1.47305° N	30.98197° E	11.2 km downstream of Hohwa 2. Downstream of wetland area, upstream of significant tributaries.	Eastern bank of strongly flowing river, approximately 50 cm below the water surface
Hohwa 3	1.50734° N	30.98309° E	16.3 km downstream of Hohwa 2. Downstream of significant tributaries, approximately midway between Hohwa 4 and Hohwa 1.	Northern bank of strongly flowing river, approximately 60 cm below the water surface
Hohwa 1	1.51905° N	30.95755° E	19.4 km downstream of Hohwa 2. Upstream of lagoon. Duplicates position from September 2007 surface and groundwater sampling (1)	Northern bank of moderately flowing river, up gradient of bridge, approximately 30 cm below the water surface.

Coordinate datum = WGS 84

Table 1.18 Descriptions of Sediment Samples

Sample	Source	Description
Hohwa 2	River	Wet, brown-black, firm, gravely, gritty loam, no observable structure, significant amount of organic matter, transported (fluvial)
Hohwa 5	River	Wet, dark-brown, firm, loam, no observable structure, transported (fluvial)
Hohwa 4	River	Wet, dark-grey, soft loam with high organic matter content (mainly roots), no observable structure, transported (fluvial)
Hohwa 3	River	Wet, grey-brown, soft, clay-loam, no observable structure, transported (fluvial)
Hohwa 1	River	Wet, light brown, soft, clay-loam, no observable structure, transported (fluvial)
KSL1	Lagoon	From near mouth of a small stream inflow

(1)ERM (2007). Specialist surface and groundwater report for the Tullow Early Production System, Uganda, Draft Report.

Sample	Source	Description
KSL2	Lagoon	Mid-lagoon
KSL3	Lagoon	Opposite side to proposed drilling operation and service road
KSS	Lake	South of spit, sufficiently deep to allow accumulation of find sediments
KSN	Lake	North of the spit, sufficiently deep to allow accumulation of find sediments
KSO	Lake	Deep water station (40 m), serve as control for subsequent surveys

Table 1.19 Organic Carbon (OC) Results for Lagoon and Lake Sediment Samples

Parameter	Units	NOAA[1]	Mean	95% CL	Mean	95% CL	Mean	95% CL
			KSL1		KSL2		KSL3	
OC	%	NV	13.5	6.9 - 20.1	15.5	8.9 - 22.1	18.0	11.4 - 24.6
			KSS		KSN		KSO	
OC	%	NV	1.4	0 – 8.0	3.9	0 - 10.5	6.1	0 - 12.7

Table 1.20 Organic Carbon (OC) and Particle Size Distribution Results for Hohwa River Samples

Analyte	Units	Hohwa 2		Hohwa 5		Hohwa 4		Hohwa 3		Hohwa 1	
		Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL
OC	%	4.5	0 - 11.1	1.0	0 - 7.6	5.2	0 - 11.8	1.5	0 - 8.1	0.9	0 - 7.5
Sand	%	69.4	46.7 – 92.0	70.9	48.3 – 93.6	34.5	11.8 – 57.2	45.4	22.7 – 68.0	57.3	34.6-80.0
Silt	%	24.4	16.7 – 32.1	21.0	13.2 – 28.7	43.4	35.6 – 51.1	27.3	19.5 – 35.0	25.4	17.7 – 33.1
Clay	%	6.3	0 – 19.4	8.2	0 – 21.3	22.2	9.0 – 35.3	27.4	14.2 – 40.5	17.3	4.1 – 30.5

Table 1.21 PAH and EPH Concentrations in Lagoon Sediments (confidence limits (CL) calculated from data in NAFIRRI report)

Parameter	Units	NOAA[1]	KSL1		KSL2		KSL3	
			Mean	95% CL	Mean	95% CL	Mean	95% CL
Naphthalene	mg/kg	0.5	**3.8**	1.7 - 5.9	**2.7**	0.6 - 4.8	**2.5**	0.4 - 4.5
Acenapthene	mg/kg	0.15	**1.00**	0.41 - 1.58	**0.76**	0.18 - 1.35	**0.65**	0.06 - 1.23
Flourene	mg/kg	0.35	**0.68**	0.29 - 1.07	**0.57**	0.17 - 0.96	**0.47**	0.08 - 0.87
Phenanthrene	mg/kg	0.26	**0.44**	0.17 - 0.72	**0.38**	0.1 - 0.66	**0.45**	0.17 - 0.72
Anthracene	mg/kg	0.30	0.22		0.05		0.08	
Flouranthene	mg/kg	1.00	0.04		0.04		0.04	
EPH	mg/kg	NV[2]	725	306 - 1143	1450	1031 - 1868	1350	931 – 1768
OC	%	NV	13.5	6.9 - 20.1	15.5	8.9 - 22.1	18.0	11.4 - 24.6

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects for freshwater sediment

[2] = No NOAA guidance value developed

Table 1.22 PAH and EPH Concentrations in Lake Sediments (mg/kg, confidence limits (CL) calculated from data in NAFIRRI report)

Parameter	Units	NOAA[1]	KSS		KSN		KSO	
			Mean	95% CL	Mean	95% CL	Mean	95% CL
Naphthalene	mg/kg	0.5	0.07	0 - 2.2	**2.43**	0.3 - 4.5	0.14	0 - 2.2
Acenapthene	mg/kg	0.15	0.02		**0.46**	0 - 1.05	0.05	
Flourene	mg/kg	0.35	0.02	0 - 0.42	0.26	0 - 0.65	0.05	0 - 0.44
Phenanthrene	mg/kg	0.26	0.03	0 - 0.31	0.16	0 - 0.43	0.07	0 - 0.34
Anthracene	mg/kg	0.30	<0.01		0.03		<0.01	
Flouranthene	mg/kg	1.00	0.04		0.03		<0.03	
EPH	mg/kg	NV[2]	170	0 - 589	275	0 - 694	320	0 - 739
OC	%	NV	1.4	0 – 8.0	3.9	0 - 10.5	6.1	0 - 12.7

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects for freshwater sediment

[2] = No NOAA guidance value developed

Table 1.23 EPH Content of River Sediment Samples

Analyte	Units	Hohwa 2		Hohwa 5		Hohwa 4		Hohwa 3		Hohwa 1	
		Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL
EPH	mg/kg	101	0 - 520	<35		130	0 - 466	48	0 - 549	52	
EPH ID		Possible carboxylic acids/PAHs		No ID possible		Possible carboxylic acids/PAHs		Unknown pattern		Possible carboxylic acids / humic acids	

Table 1.24 Trace Metal Concentrations in River Sediments (mg/kg)

Analyte	NOAA[1]	Hohwa 2		Hohwa 5		Hohwa 4		Hohwa 3		Hohwa 1	
		Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL	Mean	95% CL
As	5.9	<3		<3		<3		<3		<3	
Cd	0.596	<0.3		<0.3		0.4		0.3		0.6	
Cr	37.3	**38.3**	13.7 - 62.8	**66.0**	41.5 - 90.5	**58.0**	33.5 - 82.5	**38.8**	14.2 - 63.3	23.0	0 - 47.5
Co	NV[2]	20.3	17.2 - 23.3	20.3	17.2 - 23.3	21.5	18.5 - 24.5	17.5	14.5 - 20.5	14.5	11.5 - 17.5
Cu	35.7	11.0	3.2 - 18.8	22.5	14.7 - 30.3	27.3	19.5 – 35.0	15.3	7.5 – 23.0	13.5	5.7 - 21.3
Pb	35.0	7.0	1.1 - 12.9	10.8	4.8 - 16.7	15.8	9.8 - 21.7	16.0	10.1 - 21.9	12.3	6.3 - 18.2
Hg	0.174	**<0.6**		**<0.6**		**<0.6**		**<0.6**		**<0.6**	
Ni	18	14.0	3.6 - 24.4	**34.3**	23.9 - 44.6	**33.8**	23.4 - 44.1	**22.3**	11.9 - 32.6	17.5	7.1 - 27.9
V	NV[2]	96.0	78.0 - 114	65.8	47.8 - 83.7	66.5	48.5 - 84.5	51.8	33.8 - 69.7	38.3	20.3 - 56.2
Zn	123.1	39.8	25.0 - 54.5	38.0	23.2 - 52.8	59.3	44.5 – 74.0	39.5	24.7 - 54.3	54.0	39.2 - 68.8

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects for freshwater sediment. **Bold** values indicate exceedence of these guidelines.

[2] = No NOAA guidance value developed

Table 1.25 Trace Metal Concentrations in Lagoon Sediments (mg/kg)

Analyte	NOAA[1]	KSL1		KSL2		KSL3	
		Mean	**95% CL**	**Mean**	**95% CL**	**Mean**	**95% CL**
Co	NV[2]	20.3	17.2 - 23.3	21.5	18.5 - 24.5	20.3	17.2 - 23.3
Cu	35.7	23.0	15.2 - 30.8	27.0	19.2 - 34.8	24.0	16.2 - 31.8
Ni	18	**33.0**	22.6 - 43.4	**35.5**	25.1 - 45.9	**33.5**	23.1 - 43.9
V	NV[2]	65.0	47.0 – 83.0	71.3	53.3 - 89.2	71.0	53.0 – 89.0
Hg	0.174	<0.6		<0.6		<0.6	

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects for freshwater sediment. **Bold** values indicate exceedence of these guidelines.

[2] = No NOAA guidance value developed

Table 1.26 Trace Metal Concentrations in Lake Sediments (mg/kg)

Analyte	NOAA[1]	KSS		KSN		KSO	
		Mean	**95% CL**	**Mean**	**95% CL**	**Mean**	**95% CL**
Co	NV[2]	16.8	13.7 - 19.8	14.5	11.5 - 17.5	18.5	15.5 - 21.5
Cu	35.7			17.0	9.2 - 24.8	30.5	22.7 - 38.3
Ni	18	7.5	0 - 17.9	**20.5**	10.1 - 30.9	**31.5**	21.1 - 41.9
V	NV[2]	18.3	0.3 - 36.2	43.3	25.3 - 61.2	60.0	42.0 – 78.0
Hg	0.174	<0.6		<0.6		<0.6	

[1] = National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines – threshold effects for freshwater sediment. **Bold** values indicate exceedence of these guidelines.

[2] = No NOAA guidance value developed

Table 2.1 Plant Species Recorded during Baseline Data Collection

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Cyperaceae	*Abildgaardia hispidula*					1		
Cyperaceae	*Abildgaardia oritrephes*	1						1
Fabaceae	*Abrus canescens*	1						1
Malvaceae	*Abutilon mauritianum*					1		
Malvaceae	*Abutilon ramosum*					1		
Mimosaceae	*Acacia brevipsica*					1		
Mimosaceae	*Acacia brevispica*		1		1			
Mimosaceae	*Acacia hecatophylla*					1		
Mimosaceae	*Acacia hockii*	1	1		1	1		
Mimosaceae	*Acacia polyacantha*			1	1	1		
Mimosaceae	*Acacia senegal*		1					
Mimosaceae	*Acacia sieberiana*		1			1		
Euphorbiaceae	*Acalypha bipartita*	1				1		1
Euphorbiaceae	*Acalypha crenata*					1		
Euphorbiaceae	*Acalypha neptunica*					1		
Euphorbiaceae	*Acalypha ornata*	1						
Euphorbiaceae	*Acalypha villicaulis*	1				1		
Euphorbiaceae	*Acalypha volkensii*				1			
Acanthaceae	*Acanthus pubescens*					1		
Amaranthaceae	*Achyranthes aspera*		1	1	1	1		
Passifloraceae	*Adenia bequaertii*	1						
Passifloraceae	*Adenia cissampeloides*							1
Passifloraceae	*Adenia schweinfurthii*			1				
Amaranthaceae	*Aerva lanata*					1		
Fabaceae	*Aeschynomene indica*					1		
Fabaceae	*Aeschynomene schimperi*					1		
Asteraceae	*Ageratum conyzoides*			1		1		
Rubiaceae	*Aidia micrantha*					1		
Lamiaceae	*Ajuga remota*					1		
Mimosaceae	*Albizia coriaria*						1	1
Mimosaceae	*Albizia grandibracteata*			1			1	1
Mimosaceae	*Albizia gummifera*	1						

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Mimosaceae	*Albizia schimperiana*					1		
Mimosaceae	*Albizia zygia*					1		
Euphorbiaceae	*Alchornea cordifolia*					1		
Scrophulariaceae	*Alectra sessiliflora*					1		
Sapindaceae	*Allophylus africanus*	1				1		1
Aloaceae	*Aloe dawei*		1		1			
Fabaceae	*Alysicarpus rugosus*					1		
Fabaceae	*Alysicarpus vaginalis*					1		
Amaranthaceae	*Amaranthus dubius*					1		
Amaranthaceae	*Amaranthus graecizans*		1			1		
Vitaceae	*Ampelocissus africana*					1		
Poaceae	*Andropogon amethystinus*				1	1	1	
Poaceae	*Andropogon schirensis*				1			
Commelinaceae	*Aneilema beniniense*					1		
Annonaceae	*Annona senegalensis*	1				1		
Commelinaceae	*Anthericopsis sepalosa*					1		
Sapindaceae	*Aphania senegalensis*			1				
Poaceae	*Aristida adscensionis*				1			
Poaceae	*Aristida hordeacea*				1			
Poaceae	*Aristida ktniensis*		1		1			
Asparagaceae	*Asparagus africanus*			1	1			
Asparagaceae	*Asparagus falcatus*	1	1		1	1	1	
Asteraceae	*Aspilia africana*			1				
Asteraceae	*Aspilia helianthoides*					1		
Aspleniaceae	*Asplenium aethiopicum*	1						
Convolvulaceae	*Astripomoea hyoscyamoides*				1			
Convolvulaceae	*Astripomoea malvacea*					1		
Acanthaceae	*Asystasia gangetica*				1			
Acanthaceae	*Asystasia mysorensis*	1			1			1
Acanthaceae	*Asystasia schimperi*				1			
Salvadoraceae	*Azima tetracantha*					1	1	
Azollaceae	*Azolla africana*					1		
Balanitaceae	*Balanites aegyptiaca*		1		1			
Basellaceae	*Basella alba*						1	1
Asclepiadaceae	*Baseonema gregorii*		1		1	1		
Asteraceae	*Berkheya spekeana*		1			1		
Asteraceae	*Bidens pilosa*		1			1		
Oxalidaceae	*Biophytum umbraculum*					1		
Acanthaceae	*Blepharis maderaspatensis*		1		1			

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Sapindaceae	*Blighia unijugata*					1		
Palmae	*Borassus aethiopum*					1		
Burseraceae	*Boswellia papyrifera*					1		
Poaceae	*Bothriochloa insculpta*					1		
Poaceae	*Bothriochloa radicans*	1			1			
Poaceae	*Brachiaria brizantha*		1		1	1		
Poaceae	*Brachiaria comata*		1		1		1	
Poaceae	*Brachiaria decumbens*	1				1		
Poaceae	*Brachiaria jubata*					1		
Poaceae	*Brachiaria ruziziensis*		1		1			
Euphorbiaceae	*Brachiaria scalaris*	1	1					1
Poaceae	*Brachiaria semiundulata*				1			
Brassicaceae	*Brassica integrifolia*					1		
Euphorbiaceae	*Bridelia micrantha*					1		
Euphorbiaceae	*Bridelia scleroneura*	1		1	1	1		
Brassicaceae	*Bryophyllum pinnatum*					1		
Cyperaceae	*Bulbostylis argenteobrunnea*					1		
Capparidaceae	*Cadaba farinosa*		1		1	1		
Capparidaceae	*Cadaba grandulosa*					1		
Fabaceae	*caliandra calothyrsus*					1		
Capparidaceae	*Capparis erythrocarpos*					1	1	
Capparidaceae	*Capparis fascicularis*					1		
Asclepiadaceae	*Caralluma tubiformis*				1			
Apocynaceae	*Carissa edulis*					1		
Polygalaceae	*Carpolobia alba*					1		
Caesalpiniaceae	*Cassia bicapsularis*	1		1				
Caesalpiniaceae	*Cassia didymobotrya*					1		
Caesalpiniaceae	*Cassia floribunda*	1				1		
Caesalpiniaceae	*Cassia kirkii*	1			1	1		
Caesalpiniaceae	*Cassia mimosoides*	1			1			
Mimosaceae	*Cassia mimozoides*					1		
Mimosaceae	*Cassia obtusifolia*					1		
Caesalpiniaceae	*Cassia occidentalis*					1		
Caesalpiniaceae	*Cassia siamea*					1		
Caesalpiniaceae	*Cassia singueana*					1		
Amaranthaceae	*Celosia insertii*					1		
Apiaceae	*Centella asiatica*					1		
Menispermaceae	*Chasmanthera dependens*				1			
Poaceae	*Chloris gayana*		1		1	1	1	

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Poaceae	*Chloris pilosa*					1		
Poaceae	*Chloris pycnothrix*					1	1	
Poaceae	*Chloris roxburghiana*					1		
Poaceae	*Chloris virgata*		1			1		
Anthericaceae	*Chlorophytum blepharophyllum*					1	1	
Anthericaceae	*Chlorophytum cameronii*					1		
Anthericaceae	*Chlorophytum comosum*				1			
Anthericaceae	*Chlorophytum semlikiense*				1			
Menispermaceae	*Cissampelos mucronata*			1				
Vitaceae	*Cissus petiolata*		1	1	1	1	1	
Vitaceae	*Cissus quadrangularis*		1		1		1	
Vitaceae	*Cissus rotundifolia*	1		1	1	1	1	1
Combretaceae	*Combretum collinum*	1				1		1
Combretaceae	*Combretum fuscum*						1	
Combretaceae	*Combretum hereroense*					1		
Combretaceae	*Combretum molle*	1	1		1			
Commelinaceae	*Commelina africana*	1	1		1	1	1	1
Commelinaceae	*Commelina benghalensis*		1		1	1		
Nyctaginaceae	*Commicarpus pedunculosus*					1		
Burseraceae	*Commiphora habessinica*	1	1		1	1		
Asteraceae	*Conyza hochstetterii*					1		
Asteraceae	*Conyza sumatrensis*			1	1			
Tiliaceae	*Corchorus hochstetteri*					1		
Tiliaceae	*Corchorus trilocularis*		1					
Boraginaceae	*Cordia monoica*		1		1	1		
Crassulaceae	*Crassula alba*				1			
Crassulaceae	*Crassula vaginata*					1		
Scrophulariaceae	*Craterostigma hirsutum*	1						
Scrophulariaceae	*Craterostigma plantagineum*	1						
Capparidaceae	*Crateva adansonii*					1	1	
Fabaceae	*Crotalaria alexandri*					1		
Fabaceae	*Crotalaria axillaris*					1		
Fabaceae	*Crotalaria glauca*					1		
Fabaceae	*Crotalaria incana*					1	1	
Euphorbiaceae	*Croton macrostachyus*					1		
Poaceae	*Ctenium somalense*					1		
Araliaceae	*Cussonia arborea*	1						
Commelinaceae	*Cyanotis barbata*	1	1		1	1		
Commelinaceae	*Cyanotis foecunda*					1	1	

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Amaranthaceae	*Cyathula achyranthoides*				1		1	
Amaranthaceae	*Cyathula cylindrica*		1		1	1	1	
Cyperaceae	*Cynodon bradleyi*					1		
Poaceae	*Cynodon dactylon*	1		1	1	1		
Poaceae	*Cynodon nlemfuensis*					1		
Caesalpiniaceae	*Cynometra alexandri*	1				1	1	
Cyperaceae	*Cyperus cyperoides*					1		
Cyperaceae	*Cyperus denudatus*					1		
Cyperaceae	*Cyperus laevigatus*					1		
Cyperaceae	*Cyperus maculatus*					1		
Cyperaceae	*Cyperus niveus*						1	
Cyperaceae	*Cyperus renschii*					1		
Cyperaceae	*Cyperus reticulatus*					1		
Cyperaceae	*Cyperus rotundus*	1				1		1
Cyperaceae	*Cyperus rubicundus*					1		
Cyperaceae	*Cyperus sp*						1	
Vitaceae	*Cyphostemma adenocaule*					1		
Vitaceae	*Cyphostemma bambuseti*	1			1	1		
Vitaceae	*Cyphostemma nigroglandulosum*				1			
Poaceae	*Dactyloctenium aegyptium*					1		
Fabaceae	*Dalbergia melanoxylon*					1		
Fabaceae	*Desmodium gangeticum*	1				1		
Fabaceae	*Desmodium repandum*					1		
Fabaceae	*Desmodium setigerum*			1				
Fabaceae	*Desmodium tortuosum*			1				
Fabaceae	*Desmodium triflorum*					1		
Fabaceae	*Desmodium velutinum*			1				
Convolvulaceae	*Dichondra repens*					1		
Mimosaceae	*Dichrostachys cinerea*		1	1		1	1	
Apocynaceae	*Dictyophleba lucida*					1		
Poaceae	*Digitaria abyssinica*				1			
Poaceae	*Digitaria diagonalis*	1			1			
Poaceae	*Digitaria longiflora*		1		1	1		
Poaceae	*Digitaria melanotricha*	1						
Poaceae	*Digitaria uniglumis*					1		
Poaceae	*Digitaria velutina*					1		
Sterculiaceae	*Dombeya kirkii*			1				
Euphorbiaceae	*Drypetes occidentalis*	1						
Acanthaceae	*Dyschoriste radicans*				1	1		

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Acanthaceae	*Dyschoriste thunbergiiflora*				1			
Poaceae	*Echinochloa crus-parmis*					1		
Poaceae	*Echinochloa crus-pavonis*			1				
Poaceae	*Echinochloa haploclada*					1		
Poaceae	*Echinochloa pyramidalis*			1				
Passifloraceae	*Efulensia montana*			1			1	
Pontederiaceae	*Eichhornia crassipes*					1		
Poaceae	*Elausine indica*				1			
Cyperaceae	*Eleocharis marginulata*					1		
Poaceae	*Enteropogon macrostachyus*		1		1			
Poaceae	*Eragrostis aspera*					1		
Poaceae	*Eragrostis cilianensis*				1	1		
Poaceae	*Eragrostis exasperata*					1		
Poaceae	*Eragrostis pilosa*					1		
Poaceae	*Eragrostis racemosa*					1		
Poaceae	*Eragrostis superba*					1		
Poaceae	*Eragrostis tremula*		1		1		1	
Poaceae	*Eriochloa meyeriana*				1			
Fabaceae	*Erythrina abyssinica*							1
Euphorbiaceae	*Erythrococca bongensis*				1			
Euphorbiaceae	*Erythrococca trichogyne*					1		
Caesalpiniaceae	*Erythrophleum guineense*					1		
Erythroxylaceae	*Erythroxylum fischeri*	1				1	1	
Ebenaceae	*Euclea divinorum*					1		
Myrtaceae	*Eugenia capensis*						1	
Euphorbiaceae	*Euphorbia abyssinica*	1						
Euphorbiaceae	*Euphorbia bwambensis*	1	1	1				
Euphorbiaceae	*Euphorbia candelabrum*		1		1	1	1	
Euphorbiaceae	*Euphorbia cyathophora*					1		
Euphorbiaceae	*Euphorbia hirta*		1			1		
Euphorbiaceae	*Euphorbia magnicapsula*					1		
Euphorbiaceae	*Euphorbia tirucalli*				1			
Convolvulaceae	*Evolvulus alsinoides*		1		1			
Moraceae	*Ficus mucuso*					1		
Moraceae	*Ficus natalensis*					1		
Moraceae	*Ficus pseudomangifera*					1		
Moraceae	*Ficus sansibarica*					1		
Moraceae	*Ficus sycomorus*			1			1	
Moraceae	*Ficus thonningii*					1		

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Moraceae	*Ficus vallis-choudae*						1	
Cyperaceae	*Fimbristylis dichotoma*		1			1		
Euphorbiaceae	*Flueggea virosa*	1	1	1		1		1
Rubiaceae	*Gardenia ternifolia*	1						
Iridaceae	*Gladiolus erectiflorus*	1						1
Fabaceae	*Glycine wightii*	1			1			
Asclepiadaceae	*Gomphocarpus physocarpus*	1						
Tiliaceae	*Grewia bicolor*		1		1		1	
Tiliaceae	*Grewia mollis*	1				1		1
Tiliaceae	*Grewia similis*	1			1			
Tiliaceae	*Grewia trichocarpa*	1	1		1	1		1
Asteraceae	*Gynura scandens*				1			
Orchidaceae	*Habenaria silvatica*	1						
Poaceae	*Hackelochloa granularis*	1						
Sapindaceae	*Haplocoelum foliolosum*		1		1			
Sapindaceae	*Haplocoelum foliosum*					1		
Simaroubaceae	*Harrisonia abyssinica*					1		
Simaroubaceae	*Harrisonia occidentalis*	1	1		1	1	1	
Poaceae	*Heteropogon contortus*		1		1	1	1	
Convolvulaceae	*Hewittia sublobata*					1		
Malvaceae	*Hibiscus canascens*				1			
Malvaceae	*Hibiscus canescens*			1	1			
Malvaceae	*Hibiscus cannabinus*			1		1		
Malvaceae	*Hibiscus diversifolius*					1		
Malvaceae	*Hibiscus micranthus*					1		
Malvaceae	*Hibiscus ovalifolius*					1		
Malvaceae	*Hibiscus surattensis*		1					
Lamiaceae	*Hoslundia opposita*	1		1	1	1	1	
Violaceae	*Hybanthus enneaspermus*				1			
Hymenocardiaceae	*Hymenocardia acida*	1						
Poaceae	*Hyparrhenia collina*	1		1	1			
Poaceae	*Hyparrhenia diplandra*					1		
Poaceae	*Hyparrhenia figariana*					1		
Poaceae	*Hyparrhenia filipendula*	1	1			1	1	1
Poaceae	*Hyparrhenia rufa*		1			1	1	
Poaceae	*Hyperrhenia disoluta*					1		
Poaceae	*Imperata cylindrica*	1		1		1		
Fabaceae	*Indigofera arrecta*		1			1		
Fabaceae	*Indigofera circinella*					1		

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Fabaceae	*Indigofera congesta*					1		
Fabaceae	*Indigofera dendroides*		1			1	1	
Fabaceae	*Indigofera emarginella*	1		1	1	1		1
Fabaceae	*Indigofera mimosoides*				1			
Fabaceae	*Indigofera secundiflora*						1	
Fabaceae	*Indigofera sp*		1		1			
Fabaceae	*Indigofera spicata*	1	1	1	1	1		
Fabaceae	*Indigofera stenophyla*					1		
Asteraceae	*Inula paniculata*					1		
Convolvulaceae	*Ipomoea alba*	1			1		1	
Convolvulaceae	*Ipomoea aquatica*					1		
Convolvulaceae	*Ipomoea shupangensis*			1				1
Convolvulaceae	*Ipomoea sinensis*		1			1		
Acanthaceae	*Justicia betonica*	1						
Acanthaceae	*Justicia exigua*			1			1	
Acanthaceae	*Justicia flava*	1	1		1	1		
Acanthaceae	*Justicia ladanoides*					1		
Acanthaceae	*Justicia matammensis*	1			1			1
Crassulaceae	*Kalanchoe densiflora*					1		
Cucurbitaceae	*Kedostris foetidissima*					1		
Bignoniaceae	*Kigelia africana*	1		1				
Rubiaceae	*Kohautia coccinea*					1		
Cyperaceae	*Kyllinga brevifolia*					1		
Cyperaceae	*Kyllinga bulbosa*		1			1	1	
Cyperaceae	*Kyllinga erecta*					1		
Anacardiaceae	*Lannea barteri*	1			1		1	1
Anacardiaceae	*Lannea edulis*					1		
Anacardiaceae	*Lannea schimperi*		1		1		1	
Verbenaceae	*Lantana camara*	1						
Urticaceae	*Laportea ovalifolia*			1				
Poaceae	*Leersia hexandra*					1		
Lamiaceae	*Leonotis nepetifolia*					1		
Convolvulaceae	*Lepistemon owariense*			1		1		1
Lamiaceae	*Leucas martinicensis*	1				1		
Hippocrateceae	*Loeseneriella apocynoides*						1	
Fabaceae	*Lonchocarpus laxiflorus*	1				1	1	
Onagraceae	*Ludwigia abyssinica*			1		1		
Onagraceae	*Ludwigia octovalvis*					1		
Capparidaceae	*Maerua duchesnei*					1		

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Capparidaceae	*Maerua oblongifolia*				1	1	1	
Capparidaceae	*Maerua triphylla*	1	1		1			
Euphorbiaceae	*Mallotus oppositifolius*					1		
Malvaceae	*Malvastrum coromandelianum*					1		
Anacardiaceae	*Mangifera indica*					1		
Euphorbiaceae	*Margaritaria discoidea*					1		
Cyperaceae	*Mariscus dubius*					1		
Cyperaceae	*Mariscus maderaspatanus*					1		
Celastraceae	*Maytenus heterophylla*					1	1	
Celastraceae	*Maytenus senegalensis*					1		
Celastraceae	*Maytenus serrata*	1		1	1		1	
Celastraceae	*Maytenus undata*					1		
Lamiaceae	*Meriandra punctata*					1		
Convolvulaceae	*Merremia tridentata*					1		
Asteraceae	*Microglossa afzelii*					1		
Moraceae	*Milicia excelsa*			1				
Mimosaceae	*Mimosa pigra*					1	1	
Sapotaceae	*Mimusops bagshawei*	1		1				1
Sapotaceae	*Mimusops kummel*			1				
Aizoaceae	*Mollugo nudicaulis*				1	1		
Euphorbiaceae	*Monadenium herbaceum*	1						
Annonaceae	*Monanthotaxis schweinfurthii*	1						1
Commelinaceae	*Murdannia simplex*				1	1		
Najadaceae	*Najas baldwinii*					1		
Loganiacea	*Nuxia floribunda*					1		
Ochnaceae	*Ochna bracteosa*	1						
Ochnaceae	*Ochna hackarsii*	1						
Ochnaceae	*Ochna holstii*		1		1			
Lamiaceae	*Ocimum americanum*					1		
Rubiaceae	*Oldenlandia lancifolia*					1		
Rubiaceae	*Oldenlandia pumilla*					1		
Oleaceae	*Olea europea*						1	
Oleandraceae	*Oleandra distenta*					1		
Flacourtiaceae	*Oncoba schweinfurthii*			1				
Lamiaceae	*Orthosiphon allenii*				1			
Lamiaceae	*Orthosiphon suffrutescens*	1			1	1		
Oxalidaceae	*Oxalis corniculata*					1		
Oxalidaceae	*Oxalis latifolia*	1				1		
Polygonaceae	*Oxygonum sinuatum*					1	1	

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Anacardiaceae	*Ozoroa insignis*	1	1		1			1
Poaceae	*Panicum hochstetteri*	1			1	1		1
Poaceae	*Panicum maximum*		1	1	1	1	1	
Poaceae	*Panicum nervatum*					1		
Poaceae	*Panicum pubiglume*					1		
Poaceae	*Panicum repens*					1	1	
Poaceae	*Panicum robynsii*				1			
Poaceae	*Panicum trichocladum*	1						
Caesalpiniaceae	*Parkninsonia scioana*					1		
Poaceae	*Paspalum scrobiculatum*	1						
Malvaceae	*Pavonia kilimandscharica*				1			
Malvaceae	*Pavonia patens*					1		
Poaceae	*Pennisetum purpureum*		1					1
Asclepiadaceae	*Periploca nigrescens*	1						
Asclepiadaceae	*Periploca somaliensis*					1		
Poaceae	*Perotis patens*				1	1		
Palmae	*Phoenix reclinata*						1	
Poaceae	*Phragmites mauritianus*					1	1	
Euphorbiaceae	*Phyllanthus amarus*					1	1	
Euphorbiaceae	*Phyllanthus fischeri*					1		
Euphorbiaceae	*Phyllanthus floribundus*	1						
Euphorbiaceae	*Phyllanthus fraternus*					1		
Euphorbiaceae	*Phyllanthus nummulariifolius*					1		
Euphorbiaceae	*Phyllanthus ovalifolius*					1		
Euphorbiaceae	*Phyllanthus rotundifolius*					1		
Solanaceae	*Physalis peruviana*					1		
Caesalpiniaceae	*Piliostigma thonningii*	1		1				
Araceae	*Pistia stratiotes*					1		
Lamiaceae	*Plectranthus decurrens*	1						
Polygalaceae	*Polygala petitiana*				1	1		
Polygonaceae	*Polygonum pulchrum*					1		
Polygonaceae	*Polygonum salicifolium*					1		
Polygonaceae	*Polygonum setosulum*			1		1		1
Portulacaceae	*Portulaca oleracea*					1		
Portulacaceae	*Portulaca oleraceae*				1	1	1	
Portulacaceae	*Portulaca petersii*					1		
Protaceae	*Protea madiensis*					1		
Fabaceae	*Pseudarthria hookeri*	1				1		
Poaceae	*Pseudochinolaena polystachya*	1						

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Rubiaceae	*Pseudomussaenda flava*	1		1				1
Rubiaceae	*Psydrax parviflora*	1			1	1		
Fabaceae	*Pterocarpus lucens*					1		
Lamiaceae	*Pycnostachys coerulea*					1		
Cyperaceae	*Pycreus niger*					1		
Cactaceae	*Rhipsalis baccifera*				1			
Vitaceae	*Rhoicissus revoilii*	1						
Anacardiaceae	*Rhus longipes*				1	1		
Anacardiaceae	*Rhus natalensis*	1			1	1	1	
Fabaceae	*Rhynchosia resinosa*					1		
Euphorbiaceae	*Ricinus communis*			1				
Rubiaceae	*Rothmannia urceliformis*					1		
Rubiaceae	*Rubiaceae Redish*				1			
Acanthaceae	*Ruellia patula*					1		
Apocynaceae	*Saba comorensis*			1				
Poaceae	*Sacciolepis rigens*				1			
Dracaenaceae	*Sansevieria dawei*		1		1		1	
Dracaenaceae	*Sansevieria intermedia*					1		
Dracaenaceae	*Sansevieria parva*					1	1	
Euphorbiaceae	*Sapium ellipticum*					1		
Cyperaceae	*Schoenoplectus latiflorus*					1		
Oleaceae	*Schrebera arborea*					1		
Cyperaceae	*Scleria distans*			1				
Cyperaceae	*Scleria sp*					1		
Rhamnaceae	*Scutia myrtina*	1				1		
Asclepiadaceae	*Secamone africana*	1						
Polygalaceae	*Securidaca longipedunculata*				1		1	
Polygalaceae	*Securidaca welwitschii*				1		1	
Fabaceae	*Sesbania sesban*						1	
Poaceae	*Setaria kagerensis*	1						1
Poaceae	*Setaria longiseta*	1						1
Poaceae	*Setaria megaphylla*			1				
Poaceae	*Setaria pumila*					1	1	
Poaceae	*Setaria sphacelata*		1			1		
Malvaceae	*Sida alba*					1		
Malvaceae	*Sida cordifolia*	1	1		1	1		
Malvaceae	*Sida ovata*					1		
Malvaceae	*Sida rhombifolia*					1		
Asteraceae	*Siegesbeckia orientalis*					1		

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Asteraceae	*Sigesbeckia abyssinica*					1		
Solanaceae	*Solanum incanum*	1	1		1	1	1	
Bignoniaceae	*Spathodea campanulata*					1		
Rubiaceae	*Spermacoce princeae*		1			1		
Rubiaceae	*Spermacoce pusilla*		1			1		
Asteraceae	*Spilanthes costata*					1		
Asteraceae	*Spilanthes mauritiana*			1				
Poaceae	*Sporobolus africanus*	1			1	1	1	
Poaceae	*Sporobolus festivus*		1		1	1		
Poaceae	*Sporobolus homblei*					1		
Poaceae	*Sporobolus panicoides*					1		
Poaceae	*Sporobolus piliferus*					1		
Poaceae	*Sporobolus pyramidalis*	1	1		1	1	1	
Commelinaceae	*Stanfieldiella imperforata*			1		1		
Apiaceae	*Steganotaenia araliacea*			1				
Poaceae	*Stenotaphrum dimidatum*					1		
Bignoniaceae	*Stereospermum kunthianum*	1		1		1	1	
Scrophulariaceae	*Striga forbesii*					1		
Scrophulariaceae	*Striga gesnerioides*					1		
Scrophulariaceae	*Striga hermonthica*					1		
Loganiaceae	*Strychnos mitis*	1						1
Ochnaceae	*Suavagesia erecta*					1		
Euphorbiaceae	*Synadenium grantii*				1			
Myrtaceae	*Syzygium owariensis*					1		
Asteraceae	*Tagetes minuta*					1		
Portulacaceae	*Talinum portulacifolium*		1		1			
Caesalpiniaceae	*Tamarindus indica*		1		1	1		
Dichapetalaceae	*Tapura fischeri*					1		
Rubiaceae	*Tarenna pavettoides*		1		1			
Rutaceae	*Teclea nobilis*					1		
Rutaceae	*Teclea trichocarpa*						1	
Fabaceae	*Tephrosia lepida*				1			
Fabaceae	*Tephrosia linearis*		1		1			
Fabaceae	*Tephrosia pumila*					1		
Fabaceae	*Tephrosia villosa*				1			
Fabaceae	*Tephrosia vogelii*		1		1			
Fabaceae	*Teramnus labialis*					1		
Combretaceae	*Terminalia brownii*		1	1	1			
Combretaceae	*Terminalia schimperiana*	1		1		1		

	Identification	Escarpment	EPS site	Mid valley	Option B	Previous records	Riparian Forest	Hohwa village
Poaceae	*Themeda triandra*		1		1		1	
Acanthaceae	*Thunbergia alata*	1						
Menispermaceae	*Tiliacora funifera*					1		
Menispermaceae	*Tiliacora latifolia*						1	
Menispermaceae	*Tinospora caffra*					1		
Euphorbiaceae	*Tragia benthamii*					1		
Euphorbiaceae	*Tragia brevipes*	1						1
Tribulaceae	*Tribulus terrestris*				1			
Rubiaceae	*Tricalysia bagshawei*				1			
Rubiaceae	*Tricalysia niamniamensis*					1		
Asteraceae	*Tridax procumbens*		1			1		
Tiliaceae	*Triumfetta brachyceras*					1		
Tiliaceae	*Triumfetta rhomboidea*	1				1		1
Typhaceae	*Typha domingensis*					1		
Hydrocharitaceae	*Vallisneria spiralis*					1		
Rubiaceae	*Vangueria apiculata*			1	1	1		
Rutaceae	*Vepris nobilis*	1						
Asteraceae	*Vernonia amygdalina*							1
Asteraceae	*Vernonia auriculifera*					1		
Asteraceae	*Vernonia smithiana*					1		
Fabaceae	*Vicia hirsuta*		1			1	1	
Fabaceae	*Vigna frutescens*		1			1		
Verbenaceae	*Vitex doniana*	1						
Poaceae	*Vossia cuspidata*					1		
Melastomataceae	*Warneckea jasminoides*	1						
Olacaceae	*Ximenia americana*	1						
Cucurbitaceae	*Zehneria scabra*		1					
Rhamnaceae	*Ziziphus abyssinica*			1				
Rhamnaceae	*Ziziphus mucronata*	1				1	1	
Total	110	81	60	130	316	75	38	

I3 FAUNA

I3.1 MAMMALS

Table 3.1 Conservation Status of Large Mammals in the Albertine Rift (according to the IUCN Categories)

Species	Common	Rare	Vulnerable	Endangered	Extinct
Black rhino					X
Hunting dog					X
Aardvark				X	
Leopard		X			
Spotted Hyena		X			
Lion		X			
Serval Cat			X		
Gorilla			X		
Ratel			X		
Buffalo	X				
J. Hartebeest	X				
Uganda kob	X				
Waterbuck	X				
Warthog	X				
Bushbuck		X			
Hippo	X				
African Elephant				X	
Patas monkey		X			
Vervet monkey		X			
Black backed Jackal		X			
Banded mongoose		X			
African Civet		X			
Sitatunga		X			
Bohor Reedbuck			X		
Oribi	X				
Porcupine		X			

I3.2 BIRDS

Ecological Characteristics

A - Afro tropical migrant a-species migrating within Africa

P- Palearctic migrant a species which bread in Europe or Asia

p- Species with at least some palearctic populations

FF- forest specialists' species of typical forests interiors and are true forest birds have characteristics of interior of little disturbed forests or habitat. Where they do occur away from interior they are usually less common. They are rarely seen in non forest habitats. Breeding is almost invariably with in the forest

F-forest generalists' species less specialized also occur in small patches of forests, may also occur in undisturbed forests but are also regularly found in forests strips, edges, gaps. They are likely to be more common there and in secondary forest than in the interior of closed canopy forest. Breeding is typically with in the forest.

f- Forests visitors often recorded in the forest but they are not dependant upon it. They are almost always more common in non forest habitats where they are most likely to breed.
W- waterbird specialists normally restricted to wetlands or open waters
w- waterbird non specialists often found near water
br- known to breed in Uganda
N- Species with various common names but no habitat codes yet.

Table 3.2 ***Birds Species List***

Species	Scientific names	Habitat Codes
Afrcan paradize flycatcher	*Terpisphone viridis*	*f*
African citril	*Serinus citrinelloides*	
African drongo	*Dicrurus adsimillis*	*F*
African firefinch	*Lagonasticta rubricata*	
African morning dove	*Streptopelia decipiens*	
African moustached warbler	*Melocichla mentalis*	*br*
African Palm Swift	*Cypsiurus parvus*	br
African pied hornbill	*Tockus fasciatus*	*F*
African Pygmy-kingfisher	*ispidina picta*	
African thrush	*Turdus pellos*	*f*
African-fish eagle	*Haliaeetus vocifer*	
African-grey hornbill	*Tockus nasutus*	
Angolla Swallow	*Hirundo angolensis*	*br*
Batluer	*Terathopius ecaudatus*	*br*
Black & white shouldered tit	*Parus guineensis*	
Black headed gonelek	*Laniarius erythrogaster*	*f*
Black headed heron	*Ardea melanocephala*	*br*
Black headed oriole	*Oriolus larvatus*	*f*
Black headed weaver	*Polecus cucullatus*	*br*
Black throated seed eater	*Serinus atrogularis*	*N*
Black-bellied Bustard	Eupodotis melanogaster	
Blue naped mousebird	*Urocolius macrourus*	
Blue spoted wood dove	*Turtur afer*	*f*
Blue spoted wood dove	*Turtur afer*	*f*
Brown backed scrub robin	*Cercotrichas hartlaubi*	*f*
Brown backed scrub robin	*Cercotrichas hartlaubi*	*f*
Brown parrot	*Poicephalus meyeri*	*f*
Brown-backed scrub robin	*Cercotrichas hartulaubi*	
Cattle egret	*Bubulcus ibis*	*br*
Chestnut-bellied kingfisher	*Halcyon leucephala*	
Common bulbul	*Pycnonotus barbatus*	*f*
Common wattle eye	*Platysteira cyanea*	*f*
Croacking cisticola	*Cisticola natalensis*	
Eastern grey plantain-eater	*Crinifer zonurus*	*F*
Fan tailed widowbird	*Euplectes axillaris*	*br*
Flappet lark	*Mirafra rufocinnamomea*	*br*
Foxy Cisticola	*Cisticola troglodytes*	
Grey backed camaroptera	*Camaroptera brachyura*	*f*
Grey backed Fiscal	*Lanius excubitoroides*	*br*
Grey caped warbler	*Eminia lepida*	*br*
Grey headed sparrow	*Passer griseus*	*br*
Hadada	*Bostrychia hagedash*	*br*
Harlequin quail	*Coturnix dolegorguei*	*br*

Helmeted guineafowl	*Numida meleagris*	*F*
Little swift	*Apus affinis*	br
Little weaver	*Ploceus luteolus*	
Long billed pepit	*Anthus similis*	*br*
Long crested eagle	*Lophaetus occipitalis*	*f*
Loughing dove	*Streptopelia senegalensis*	*br*
Marabou Stork	*Leptoptilos crumeniferus*	*br*
Marico sunbird	*Cinnyris mariquensis*	*br*
Montiguers harrier	*Circus pygargus*	*P*
Northern Black Flycatcher	*Melaenornis edolioides*	
Northern Red Bishop	*Euplectes franciscanus*	
Olive bee Eater	*Merops nubicus*	*A*
Palm swift	*Cypsiurus parvus*	*br*
Palmnut vulture	*Gypohierax angolensis*	*F*
Red billed firefinch	*Lagonosticta senegala*	
Red eyed dove	*Streptopelia semitorquata*	*f*
Red faced cisticola	*Cisticola erythrops*	*br*
Red knecked spurfowl	*Francolinus afer*	*br*
Red-chested Sunbird	*Cinnyris erythrocerca*	br
Red-eyed Dove	*Streptopelia semitorquata*	f
Ruppelles long tailed starling	*Lamprotornis purpuropterus*	*br*
Speckled Mousebird	*Colius striatus*	*br*
Speckled tinkerbird	Pogoniulus scolopaceus	*F*
Splendid Glossy Starling	*Lamprotornis splendidus*	*F*
Sulpher breasted bush shrike	*Malaconotus sulfureopectus*	*br*
Tawny flanked prinia	*Prinia subflava*	*fw*
Tropical boubou	*Laniarius aethiopicus*	*br*
White throated bee eater	*Merops albicollis*	*br*
Winding cisticola	*Cisticola galactotes*	*br*
Yellow fronted canary	*Serinus mozambicus*	
Yellow rumped tinkerbird	*Pogoniulus bilineatus*	*F*
Yellow White-eye	*Zesterops senegalensis*	*br*

Table 3.3 Amphibians

Species	**Place**	**Abundance**
Hyperoliidae		
Afrixalus fulvovittatus		25
Hyperolius cinnamomeoventris		42
Hyperolius lateralis lateralis		38
Hyperolius acuticeps		16
*Hyperoli*us *viridiflavus viridiflavus*		14
Kassi*na senegalensis*		50
Petropedetidae		
Phrynobatrachus natalensis	Mputa 3	82
Phrynobatrachus acrid oides		22
Ranidae		
Ptychadena anchiate	Mputa 1	56
Ptychadena mascareniensis		12

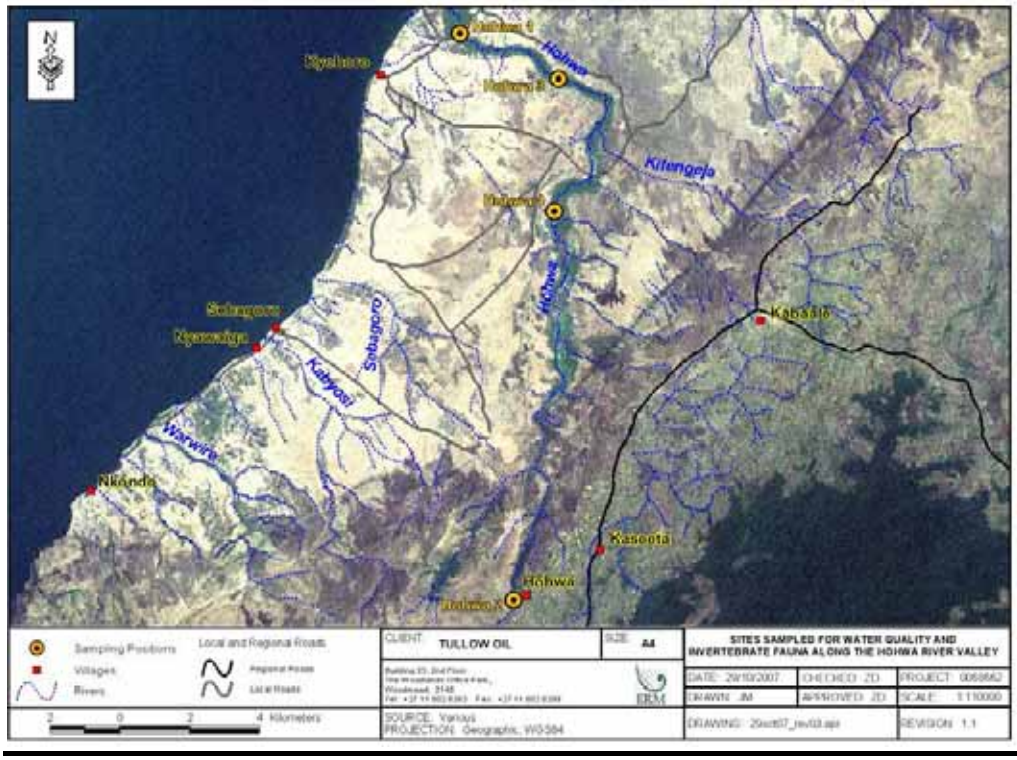
Table 3.4 Reptiles

Species	Common Name	Ecological Status
Lizards		
Varanus nilotics	Monitor lizard	Widespread in the East African region round lakes and rivers.
Agama agama	Red-headed Rock Agama	Wide distribution in E. Africa
Geckos		
Hemidactylus brooki	Broke's Gecko	Widely distributed and tolerant to a range of habitats
Hemidactylus mabouia	House Gecko	Very widely distributed, abundant in human settlements to open savannas
Skinks		
Mabuya Maculilabris	Speckle-lipped Skink	Widely distributed and tolerant to a range of habitats
Mabuya striata	Striped Skink	Widely distributed throughout E. Africa. Tolerant to a wide range of habitats
Snakes		
Philopthamnus semivariegatus	Spotted Bush Snake	
Psammophis sibilans	African Beauty Snake (African Racer)	

I3.3 INVERTEBRATES

I3.3.1 Invertebrate Sampling along the Hohwa River

Figure 3.1 Sample Sites along the Hohwa River



I3.3.2 Micro-invertebrates

Table 3.5 Zooplankton Species Checklist for the Five Sites Sampled along the Hohwa River

Taxa	Hohwa 1	Hohwa 2	Hohwa 3	Hohwa 4	Hohwa 5	Ngassa Lagoon
COPEPODA						
Harpacticoida	P	A	P	A	A	A
Cyclopoida						
Afrocyclops sp	P	A	A	A	A	A
Mesocyclops sp.	P	A	A	A	A	P
Thermocyclops neglectus	A	A	A	A	A	P
Tropocyclops confinnis	P	A	A	A	A	A
Tropocyclops tenellus	A	A	P	A	A	A
Cyclopoid copepodite	P	P	P	P	P	P
Nauplius larvae	P	P	P	P	P	P
CLADOCERA						
Ceriodaphnia sp	A	A	A	A	A	p
Chydorus spp.	P	P	A	P	A	A
Macrothrix sp.	P	A	A	A	A	A
Moina micrura	P	A	A	A	A	P
ROTIFERA						
Ascomorpha sp	A	A	A	A	A	P
Asplanchna sp	A	A	A	A	A	p
Brachionus angularis	P	A	P	P	P	P
Brachionus calysiflorus	A	A	A	A	A	P
Brachionus falcatus	A	A	A	A	A	p
Hexathra sp	A	A	A	A	A	p
Filinia opoliensis	A	A	P	A	A	A
Keratella tropica	P	A	P	A	A	A
Lecane bulla	P	P	P	P	A	p
Platyas quadricornis	A	A	P	A	A	A
Polyarthra vulgaris.	P	A	A	A	A	p
Synchaeta pectinata	A	A	P	P	A	p
Synchaeta spp.	A	P	A	P	A	p
Trichocerca cylindrica	P	A	P	P	A	A

Figure 3.2 ***Species richness of major groups of zooplankton at sampled sites along the Hohwa river course, October 2007***

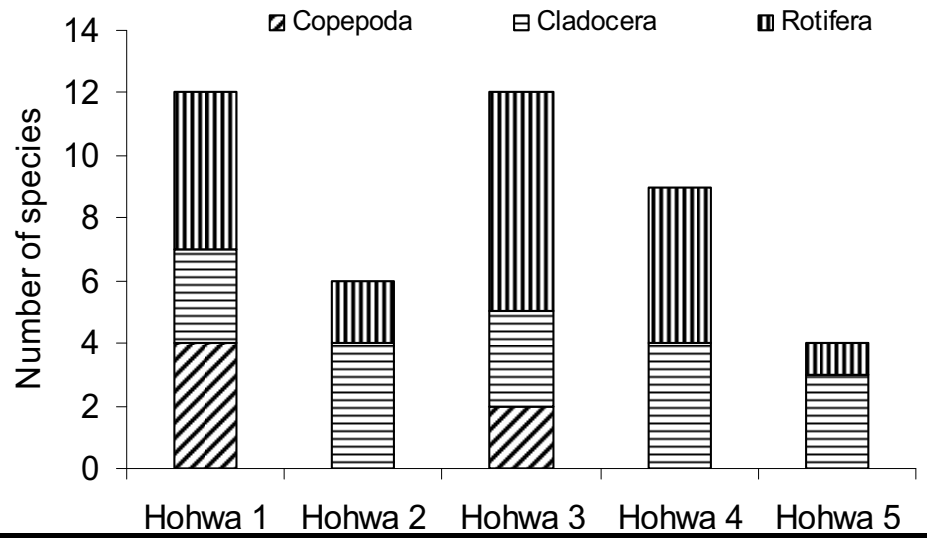


Figure 3.3 ***Numerical abundance of major zooplankton taxa at different sites along the Hohwa river course, October 2007.***

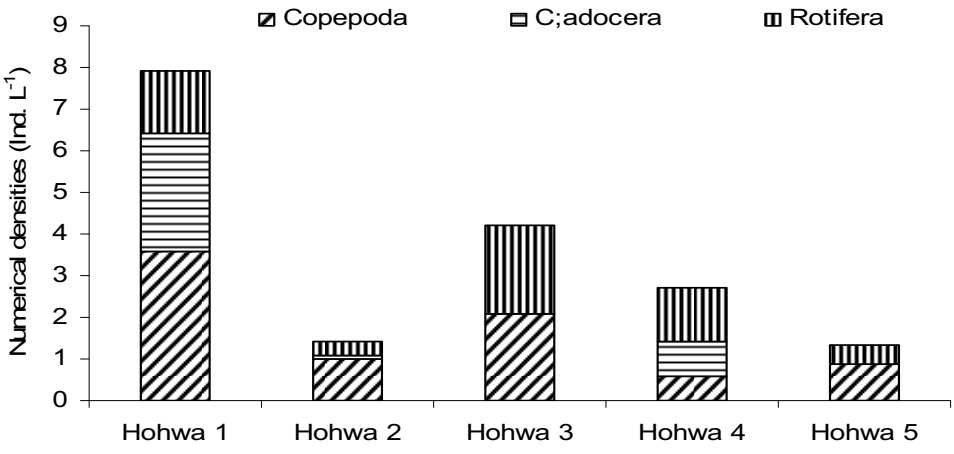
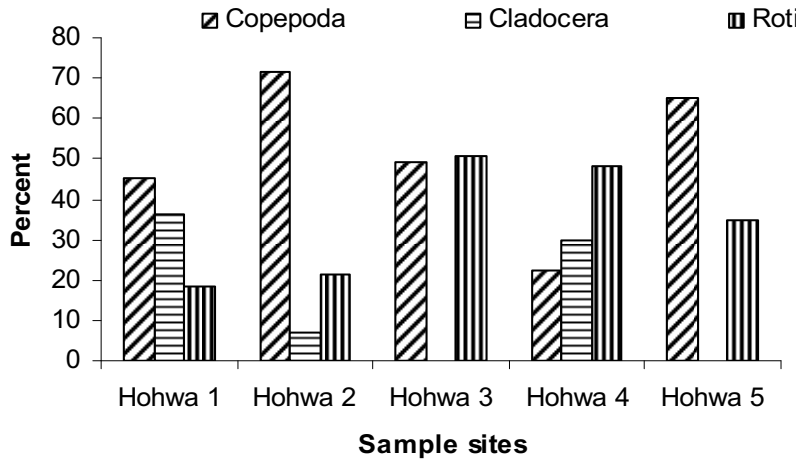


Figure 3.4 ***Percent contribution of the three broad taxonomic groups of zooplankton identified at each site sampled along the Hohwa river course, October 2007***



I3.3.3 ***Macro-invertebrates***

Table 3.6 ***Taxonomic Checklist of Macro-invertebrates and Counts of Recovered Taxa at the Sampled Sites along the Hohwa River Course, October 2007.***

	Hohwa 1	**Hohwa 2**	**Hohwa 3**	**Hohwa 4**	**Hohwa 5**	**%Frequency Hohwa River**	**Ngassa♠ Lagoon (0.6-1.6m)**
Depth (m)	**0.4**	**0.3**	**1.5**	**1.4**	**0.1**		
Taxa:							
Bivalvia							**A**
Pisidium victoriae	0	90	0	0	2	40	
Gastropoda							**A**
Biomphalaria sp.	0	129	0	2	0	40	
Ephemeroptera							**A**
Caenis sp	0	12	5	5	2	80	
Baetidae	0	0	5	2	0	40	
Leptophlebidae	0	0	5	2	0	40	
Odonata							A
Libellulidae (*Brechmorrhoga* sp)	0	27	0	0	0	20	
Gomphidae (*Progomphus* sp.)	0	0	0	0	2	20	
Protoneuridae	0	58	0	17	0	40	
Diptera							P
Ablabesmyia	0	2	0	0	0	20	
Chironominae	66	112	19	2	7	100	
Palpomyia sp.	0	0	2	0	2	40	
Tipluidae	0	2	0	0	0	20	
Trichoptera							A
Leptoceridae	0	2	5	0	0	40	
Hydropsychidae	0	10	0	0	0	20	
Coleoptera							A
Gyrinidae	0	0	0	2	0	20	
Dytiscidae	0	2	0	0	0	20	
Elmids (*Ancyronyx* sp.)	0	24	0	0	0	20	

	Hohwa 1	Hohwa 2	Hohwa 3	Hohwa 4	Hohwa 5	%Frequency Hohwa River	Ngassa* Lagoon (0.6-1.6m)
Hydrophilidae	0	2	0	0	0	20	
Staphylinidae	0	2	0	0	0	20	
Hemiptera							A
Geriidae	0	5	0	10	0	40	
Lepidoptera							A
Pyralidae	0	10	0	0	0	20	
Oligochaeta (*Nais* sp)	0	0	5	0	2	40	P

Figure 3.5 ***Pooled counts of all macro- invertebrate taxa at each of the sites sampled along the Hohwa river course, October 2007***

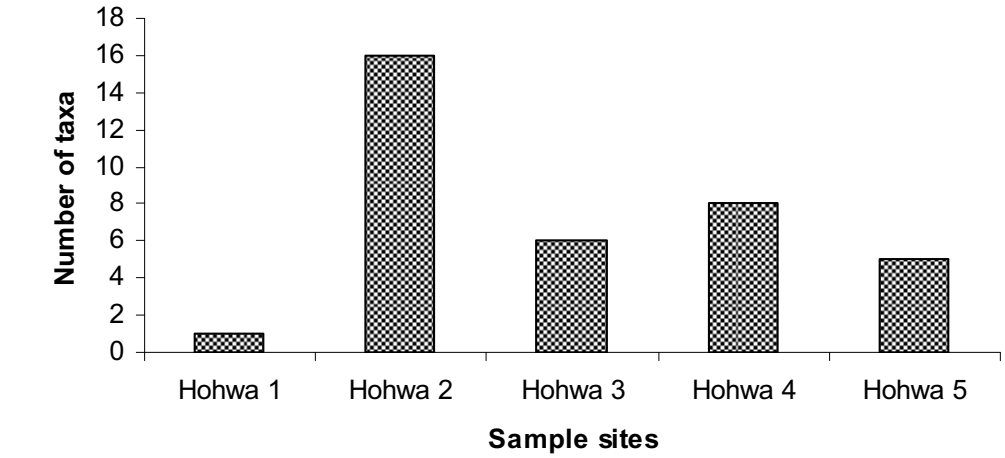
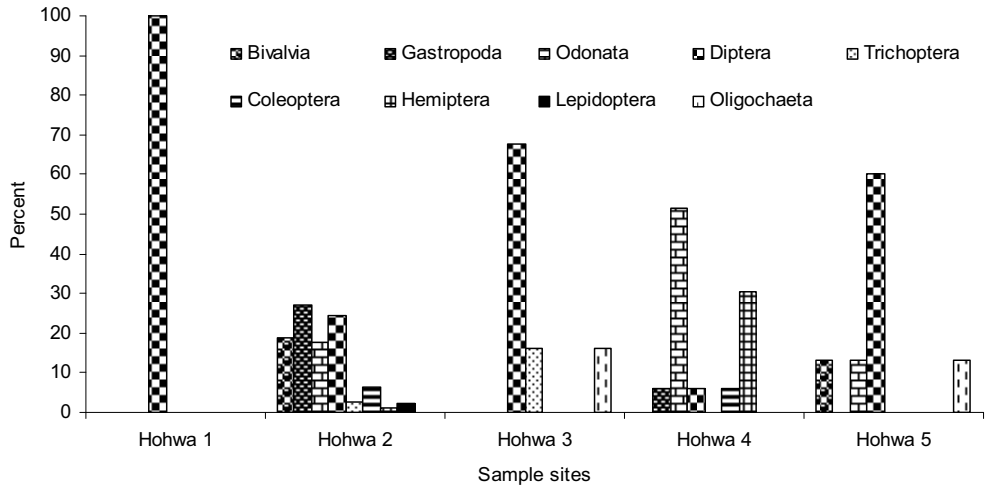


Figure 3.6 ***Percent contribution of macro-benthos taxa at the sites samples along the Hohwa river course, October 2007.***



I3.3.4 Insects

Table 3.7 Butterfly Species Recorded

Family	Species	Ecological type	Number (s)
Nyphalidae	*Acraea braesia*	O	1
	Amauris tarterea	f	2
	Ariadnae enotrea	f	4
	Bicyclus safitza	W	6
	Charaxes varanes	W	2
	Cymothoe ochreata	F	1
	Danaus chrysippus	O/m	6
	Henotesia perspicua	O	2
	Hypolimnas misippus	W/m	3
	Junonia Chorimene	O	1
	Melanitis leda	W	2
	Neptis melicerta	F	2
	Ypthima asterope	O	14
	Ypthima granulosus	O	4
Pieridae	*Belenois aurota*	O/m	30
	Belenois creona	O/m	23
	Belenois thysa	f	37
	Catopsilia florella	O/m	11
	Colotis aurigineus	W	34
	Colotis eucharis	W	47
	Colotis euippe	W	43
	Colotis evagore	O/m	45
	Colotis halimede	O	40
	Colotis hetaera	O	18
	Colotis ione	O	26
	Colotis protomedia	O	18
	Colotis vesta	O	10
	Eronia cleodora	O	6
	Eurema hecabe	W/m	12
	Pinacopteryx eriphia	O	2
Papilionidae	*Papilio bromius*	f	2
Lycaenidae	*Anthene rubricinctus*	F	2
	Cupidopsis jobates	W	7
	Eicochrysops hippocrates	O	5
	Freyeria trochylus	W	24
	Hypolycaena pachalica	O	4
	Leptotes pirithus	W/m	5
	Pentila pauli	f	6
	Zizeeria knysna	W	14
	Zizina antanossa	W	24
	Zizula hylax	W	32
Hesperiidae	*Borbo borbonica*	W/m	2
	Borbo gamella	W	3

Table 3.8 Ondata Species Recorded

Order	Species	Number(s)	Habitat	Distribution
Anisoptera	*Aeshna Sp*	15	*	*
	Atoconeura pseudeudoxia	3	Montane forest streams	Western Uganda
	Brachythemis lacustris	2	Grassy and reedy pools, streams, rivers, gregarious	Cape to Ethiopia, west to Senegal
	Brachythemis leucosticta	5	Grassy pools and lakes gregarious	Most of Africa except forest
	Crocothemis erythrea	9	Pools, streams, lakes. Swamps in savanna, bush, woodland	Widespread all over Africa, not in forest
	Orthetrum chrysostigma	11	Common in open country; bush, savanna or woodlands	Most of continental Africa
	Orthetrum julia	14	Forest and dense woodland, streams	Common migrant all over continental Africa
	Orthetrum trinacria	6	Pools, lakes and rivers in savannah, bush and woodland	Most parts of Africa except dense forest, common
	Palpopleura deceptor	23	Reedy sluggish streams or pools in bush and woodland	Most of continental Africa
	Pantala flavescens	18	Temporary pools, desert to forest edge	Uganda, DRC to Cameroon
	Phyllomacromia picta	24	Bush country, fridge of riverine forest	Most of continental Africa
Zygoptera	*Aciagrion sp*	1	*	*
	Elattoneura glauca	6	Widespread, usually riverine, prefers damp, shady spots, bush, woodland	Common in most parts of continental Africa
	Lestes virgatus	2	Locally common in woodland or forest, sometimes thick bush	Nigeria to Ethiopia and south to the Cape
	Platycnemis congolensis	1	*	Uganda, DRC
	Platycypha caligata	11	Streams and rivers in forest, bush or riparian forest, sometimes lacustrine at large lakes	Widespread and common in east, South and Central Africa
	Pseudagrion hegeni	3	Forest, bush and woodland at well-shaded streams	Equatorial East and West Africa southwards to Natal
	Pseudagrion melanicterum	5	Forest streams, thick bush and litus	Zambia northwards to Uganda? Kenya, westwards to Senegal

Annex J

Meeting Minutes - Future Management of the Kabwoya Wildlife Reserve

On the 10th January 2008 a meeting was held between UWA, NEMA, PEPD, Kabwoya Reserve Concessionaire Holder and Tullow Oil at Nzizi 1 Camp, Kaiso-Tonya Valley. The Agenda included, amongst other issues, an item on the future co-existence of oil and gas exploration and development operations and conservation in the Kabwoya Wildlife Reserve. The meeting was attended by:

- UWA Executive Director (Mr Moses Mapesa)
- UWA Chairman Board of Trustees (Andrew Kasirye)
- UWA Planning & EIA Coordinator (Edgar Buhanga)
- PEPD Robert Kasanda and Honey Malinga
- NEMA Patrick Kamanda
- UWA Chief Warden, Murchison's Falls National Park
- UWA Kaiso Tonya Site Representative
- Kabwohya Reserve Concessionaire Holder Bruce Martin
- Tullow Oil: John Morley Development Manager, Rex Quick & Lynda Biribonwa Environmental Advisors, Doug Sculley EHS

With regard to the siting of the Early Production System (EPS) within or outside the reserve, Mr. Mapesa reported that UWA had reviewed the legislative options available. They had concluded that there was provision for co-existence of oil and gas exploration and production operations (including the EPS) and conservation in the Kabwoya Wildlife Reserve within the existing Uganda Wildlife Act. He advised that rather than go through the process of degazetting the land this option should be exercised. He was supported by the Chairman of the UWA Board of Trustees (Mr Kasirye) in this recommendation. Consequently, it was concluded by those present that the provisions of the Uganda Wildlife Act would be used to guide the way forward for management of the reserve.