NEWMONT
The Gold Company

SURGOLD

Merian Project – ESIA Survey Methodologies

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This document serves to outline the preliminary methodologies for the primary environmental and social studies needed to support the development of the Environmental and Social Impact Assessment (ESIA) of the Merian Gold Project.

These methodologies have been provided to allow the reader a clear understanding of how the specific studies will be conducted; describing in greater detail aspects: amounts of field work, sampling locations and frequencies, survey schedules, etc.

These survey methodologies have been provided as an addendum to the ESIA's Terms of Reference (ToR), which detail the objectives, define the scope, and establish the strategy and schedule to develop, review, and approve an ESIA for the construction and operation of the Merian Project.

In addition to national regulatory requirements, the Project and ESIA process will be consistent with all relevant international standards and requirements (if applicable). These include international treaties and conventions, to which Suriname is a signatory, dealing with biodiversity, climate change and marine pollution.

Furthermore, the Project and ESIA process will be guided by international best-practices, notably standards and guidelines such as the Equator Principles and the IFC Performance Standards that govern environmental and social practices in private sector investments as well as NIMOS EIA guidelines.

The proposed project will adapt best practices, international standards and treaties to the specific project context to meet sustainability objectives. As a subsidiary, Surgold must comply with Newmont's corporate standards and management policies including Newmont's Social Responsibility standard.

All data collection and surveying will be guided by these standards.

The primary purpose of the baseline (field) studies is to collect data to describe the current conditions of the potential project affected area and to establish a foundation for an accurate and systematic prediction of the likely environmental, socio-economic and health impacts. In this case, a key component of the baseline studies will be to clearly delineate impacts from past and existing activities in the project area, including exploration and small scale mining activities (known locally as porknocking).

The field studies will include comprehensive data acquisition activities through Specialist Studies. Where practical, interpretation and evaluation will be conducted during the course of the data acquisition to allow for modification of field research as and when required to generate sufficient data to analyze impacts.

2.1   *ENVIRONMENTAL BASELINE STUDIES*

The following baseline environmental field studies are needed based on our review of available information.

2.1.1   *SURFACE AND GROUNDWATER STUDIES*

Water resources require careful consideration in the development of the baseline program and the ESIA. The IFC Performance Standards and Environmental and Environmental Health and Safety Guidelines for Mining both specifically address water resource management and these along with Suriname legislation and regulations will be the guidelines and standards referenced within the water resources impact assessment.

Surgold recognizes the importance of both surface and groundwater resources and the variability associated with water resources both geographically across the Environmental Study Area as well as seasonally therefore, Surgold began collecting baseline data early in the project in order to capture variability within baseline conditions. The surface water sampling program in 2003 and the groundwater program in 2009. Climate data collection began in 2005 as climate data is an important supplement to water resources data as well as air quality considerations.

For the formal start of the permitting process, additional data collection will be needed to support the development of the ESIA. A formal Sampling and Analysis Plan (SAP) is being developed and will include specifications for data validation and Quality Assurance and Quality Control (QA/QC) for both groundwater and surface water. The planned field studies are more fully discussed below. A water resources monitoring network has been planned with attention given to mine components, potential impacts, small scale mining activities, access, and the need for background/reference sites. Figure 1 illustrates the current proposed network of groundwater and surface water monitoring locations.

Quality Assurance (QA) refers to a detailed protocol used to produce high quality products, while Quality Control (QC) refers to the process by which this protocol is tested to ensure that final products are of a specified quality. With respect to water sampling, QA protocols include the use of trained personnel, proper sampling methods, clean containers and equipment, proper sample preservation and transportation and detailed documentation of the entire process. Field, travel and other assorted test blanks are used for QC. Each water sampling program, Surface and Groundwater, will have its own specific QA/QC program.

Laboratory selection is currently underway. Issues that influence laboratory selection include sample holding times for specific parameters, reporting limits below project water quality criteria for all relevant parameters, laboratory certification and quality assurance/quality control (QA/QC) programs, and logistics involved in potentially exporting samples outside of Suriname and importing required preservatives. It is expected that the laboratory will provide pre-cleaned sample containers, shipping containers, required forms for sample submission and specific sample shipping instructions as is typical in the industry.

Surface Water

Surface water information is needed regarding both the quantity and quality of water in the streams that surround the project and that may be impacted by the project. As noted earlier, surface water sampling at the project has been completed since 2003 and includes locations above and below the planned mine facilities in both the Commewijne and Marrowijne basins. Also collected during these sampling events were sediment quality and streamflow (quantity) measurements. While many of the previous sampling sites will continue to be used in the current sampling program, some additional sites and or changes in site locations are needed due to changes in the project design. In addition to water quality data collection, continuous monitoring of streamflow at certain locations is needed to assist in facility design and development of the water management program for the mine. Figure 1 shows the preliminary locations of water quality and streamflow gauging sites. These locations are still being finalized, but only minor changes are expected in the points shown. At the locations where continuous flow data will be collected, meters will also be installed to measure turbidity. The relationship between turbidity and the level of total suspended solids (TSS) in the streams will be established so that a solid understanding of baseline TSS conditions can be determined.

Surface Water Quality

Analysis of surface water quality will be completed both in the field and the laboratory. A surface water field program will be executed four times a year corresponding with the four seasons. Grab samples will be collected for laboratory analysis and measurements of certain parameters will be made in the field at the time of sample collection. Field measurements are made of parameters that must be measured in-situ such as temperature and dissolved oxygen, as these parameters are a function of ambient conditions. Field parameters will be measured with an in-stream probe and will include:

- pH
- Specific conductivity
- Temperature
- Redox potential (Eh)
- Dissolved oxygen
- Turbidity
- Streamflow

The field program will have a Sampling and Analysis Plan including a Quality Assurance/Quality Control program including proper collection methodology to prevent sample contamination, field blanks, collection of duplicate samples, regular cleaning and calibration of field equipment and thorough documentation.

The analytical parameters for surface water will include total and dissolved metals (Al, Sb, As, Ba, Be, B, Cd, Cr, Cr (IV), Co, Cu, F, Cl, Fe, Pb, Mn, Hg, Mo, Ni, Se, Si, Ag, Th, V and Zn), ions (Ca, Mg, Na, K), cyanide, nutrients (nitrate+nitrate, ammonia,

phosphorous), physical parameters (pH, conductivity, TDS, TSS, hardness and alkalinity), oil and grease, chlorine and bacteriological measurements. The program will continue the standing protocol of quarterly sampling, with planned samplings in November, February, and April.

Water quality data from 2003 onward will be summarized and analysed for trends and/or potential impacts from small scale mining. All water data will be analysed and presented based on watershed. Water quality data at each sampling location will be analysed for maximum, minimum, average and standard deviation of concentrations for parameters for which the project has a performance criteria established either through international standards, legal requirements including permitting and internal project standards. Data will also be analysed for seasonal variability.

Streamflow

Six hydrometric stations will be established in the project area as shown in Figure 1. A hydrometric station is a site at which continuous water level data is recorded by a data-logger and for which a rating curve is established so that a continuous record of streamflow can be established. A rating curve describes the unique relationship between water level and total streamflow (volume/time) at a creek cross-section. In order to develop the rating curve, streamflow measurements must be made at various water levels. Therefore at the beginning of the program a more intensive period of streamflow measurements will be undertaken until a rating curve can be established. Streamflow will be calculated based on the USGS mid-section method. Once data loggers are downloaded the water level data is transformed into streamflow data by applying the rating curve relationship to the water level data.

Streamflow measurements will also be made each time a water quality sample is collected. This practice provides additional data required for loading analyses.

Groundwater

The groundwater monitoring program will entail groundwater quality and groundwater elevations measurements at the locations shown in Figure 1. Groundwater samples will be collected for water quality analysis on a monthly basis to evaluate temporal variability. Water elevations will be measured at the same time as water quality samples.

Water samples will be collected using downhole pumps and water levels collected using a standard water level metre. The field program will have a Sampling and Analysis Plan including a Quality Assurance/Quality Control program including collection methodology to prevent sample contamination. Water quality samples will only be collected after the well is purged and the field parameters of (pH, temperature, specific conductance, temperature, and turbidity) stabilize so that the sample is representative of the aquifer; field blanks, collection of duplicate samples, and regular cleaning and calibration of field equipment and thorough documentation will also be included.

The analytical parameters for groundwater will include dissolved metals (Al, Sb, As, Ba, Be, B, Cd, Cr, Cr (IV), Co, Cu, F, Cl, Fe, Pb, Mn, Hg, Mn, Mo, Ni, Se, Ag, Th, Si, V and Zn), ions (Ca, Mg, Na, K), cyanide, nutrients (nitrate+nitrate, ammonia, phosphorous), physical parameters (pH, conductivity, TDS, TSS, hardness, alkalinity and sulphate) chlorine and bacteriological measurements.

Baseline water quality data will be analysed for maximum, minimum, average and standard deviation for concentrations at each sampling location for parameters for

which the project has a performance criteria established either through international standards, legal requirements including permitting and internal project standards.

2.1.2 AIR QUALITY STUDY AND CLIMATE STUDIES

Baseline air quality data is important to establish specifically with respect to parameters that may be released or impacted by the project including particulate matter with diameter less than 10 microns (PM_{10}), total suspended particulates (TSP), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2).

At least three monitoring stations will be established:
- Near the Maraba Pit;
- Near the processing Plant Site; and
- Along Moengo-Langatabiki Road in an area named Pelgrin Kondre;

A site trip will be scheduled by ERM in mid-October 2011 for the purpose of installing the three monitoring stations (TSP and PM_{10} high volume samplers and NO_2 and SO_2 passive diffusive samplers) and to provide training to an onsite technician (Surgold Staff) on proper operation and maintenance of the equipment and sampling handling procedures. The TSP and PM10 samplers will have their flow rate calibrations verified on-site after installation to ensure proper operation. To the extent possible, monitors will be located away from roadways, trees, building, or other disturbances that may cause undue localized influences on the measured pollutant concentrations. Prior to the installation of the monitors, an onsite generator will be located approximately 45 meters away in the general downwind location from the monitoring equipment to avoid measureable impacts from the generator exhaust.. Following installation, the site operator will be trained to inspect and maintain the monitoring site.

ERM will collect measured TSP and PM_{10} filters every third day in accordance with the USEPA national sampling schedule for 4 weeks between mid-October and mid-November, which is generally, considered the end of the long "dry" season. The filters will be folded in half, exposed side against itself, and placed in sealed plastic bag for return to the ERM laboratory in Ontario, California (United States). During the 30-day monitoring program, each monitoring site will collect 10 individual 24-hour samples, for a total of 30 TSP samples and 30 PM_{10} samples. In addition, one blank filter will be returned for every two sampling days.

The NO_2 and SO_2 passive samplers will be placed at each monitoring site for 7-day periods, so that a total of four samples each for NO_2 and SO_2 concentrations at each site will be collected during the 4-week monitoring period. The shelters will be placed within small shelter housings to offer protection from rain.

Each week, all collected particulate filters (stored in sealed plastic bags) and NO_2 and SO_2 diffusive samplers will be shipped to the ERM's California laboratory in the United States for analysis and sample processing (total of 4 shipments). The TSP and PM_{10} samples will be equilibrated and weighed in the ERM laboratory and particulate concentrations will be determined. The diffusive samplers will be forwarded under chain-of-custody to Columbia Analytical Services for analysis of NO_2 and SO_2 concentrations. Analysis will be performed using either colorimetry and/or ion chromatography, as appropriate.

Concentration results will be reported after completion of the monitoring program (i.e., after 4 weeks). A data summary report will be submitted to Surgold within approximately 45 days after the end of the monitoring period and contain the following:

1. A listing of all valid hourly meteorological data obtained from the nearby meteorological monitoring station and wind rose analyses;
2. A summary of the PM_{10} and TSP 24-hour concentrations and NO_2 and SO_2 concentrations for comparison to the U.S. National Ambient Air Quality Standard (NAAQS), World Bank Air Quality Standards (WBAQS), and applicable IFC Performance Standards/Equator Principles;
3. A discussion of measured exceedances of the NAAQS, WBAQS or IFC Performance Standards, if any;
4. A determination of the percentage of data recovered; and
5. Associated QA/QC results.

Surgold has been collecting meteorological data (hourly averages) from a local weather station onsite since 2006. ERM will summarize all the meteorological data (rainfall, temperature, relative, humidity, wind speed and direction, and solar radiation) collected to date to establish a baseline climatic condition of the site. The wind speed and direction data will be used to create wind rose data summarizing wind patterns during the sampling period, as well as to assess diurnal variation. Meteorological data, particularly wind speed and direction and solar radiation will be used in the analysis of pollutant concentrations and potential ambient air impacts. An air dispersion modelling will be conducted for the Merian Gold Mine Project to determine impacts to nearest receptors.

2.1.3 NOISE STUDY

ERM will conduct ambient noise monitoring at two locations (near Maraba Pit and near the Security Gate, approximately 4 km southeast of the Plant Site) to characterize the existing noise environment around the Mine Site. Hourly average equivalent noise levels (L_{Aeq}) will be measured in A-weighted decibels (dBA) for a period of 1 hour at each location. Noise monitoring equipment will be calibrated before and after each measurement. The equipment (with attached microphone) will be placed at approximately 1.5 m above ground level and away from buildings/structures to prevent reflection. A windscreen will be placed on the microphone to prevent measuring errors by wind blowing across the microphone. Equipment would be checked periodically to ensure device is working properly; Climatic conditions and ambient sounds observed during the measurement period would be documented. The measured ambient levels will be compared with IFC's noise standards for residential and industrial areas. The methodology, locations and results of the ambient noise monitoring at the Mine Site will be summarized in the ESIA. The sound level log sheets and calibration certificates would be included as attachments to the ESIA report.

To characterize the existing noise environment along the Transport Road, hourly traffic counts (including vehicle type and speed limits), will be collected at 3 locations along the Moengo-Tabiki Road. Since vehicle traffic is the dominant noise source along the road, baseline hourly L_{Aeq} levels will be calculated using the traffic volumes, vehicle type, and vehicle speed limits collected at each traffic count location. The calculated baseline noise levels will be compared with IFC's noise standards for residential and industrial areas. The methodology, locations and results of the calculated baseline noise levels along the Transport Road will be summarized in the ESIA.

2.1.4 FLORA STUDIES

Our approach to vegetation / flora assessment is based on the inventorying of transects (in fact long, narrow plots) in the field at representative locations, and

opportunistic collecting of plants at the mine site. Our principal aim is to produce a ground truth-ed vegetation typology and a map of the vegetation of the Mine Site.

Habitat

Given the focus on flora, birds, herps, mammals and insects, the assessment of habitats must take into consideration what represents habitats for these (predominantly) medium- size to large plants and animals. It should be understood that habitat is always defined in function of specific taxa, such as plant or animal groups or species.

Alongside disturbance, abiotic factors, such as climate, general land form, meso/micro topography, drainage and soil type represent meaningful habitat dimensions for plants. They determine if habitats are suitable for specific plants, and result in a specific type of vegetation. These dimensions are also important for the fauna, as is well known for e.g. amphibians and birds. We propose to assess these abiotic factors at Merian.

Living and dead vegetation / plants represents an essential part of the habitat dimension for the fauna, not in the least in terms of the structure they provide. Assessments of vegetation structure are often done in conjunction with bird studies, and have proven to be useful to understand the impact of disturbance on the fauna. Here, we propose to assess vegetation structure at Merian, independent of vegetation composition.

Of course, additional habitat factors / dimensions are important, such as vegetation composition, but these depend very much on the specific plant or animal subgroup or species that is being considered. We will deal with vegetation composition as a separate matter (below). We will advise a posteriori on the eventual need to investigate additional habitat dimensions, based on our observations in the field.

Flora / Vegetation

Very little information is available regarding the flora of the Merian area. No large flora studies have been undertaken in the area and it is very unclear if and how much recordings are available at the National Herbarium of Suriname (BBS), but it is very likely that there is hardly any at BBS. As there is very little or no reference data available of the Merian area, this study will need a thorough approach to be able to investigate the current flora / vegetation properly.

Our approach to vegetation / flora assessment is based on the inventorying of transects (in fact long, narrow plots) in the field at representative locations, and opportunistic collecting of plants in the environmental study area. The vegetation and flora study will produce a ground- truthed vegetation typology and map of the vegetation in the environmental study area. The *a priori* classification of vegetation will be based on Teunissen's (1978, 1980) and Bordenave's (unpublished) vegetation typologies, and vegetation descriptions in the CI RAP report, although the vegetation may differ due to changes in the elevation. Teunissen (1978, 1980) serves as a reference for the Suriname lowlands (lowlands north of the Guiana Shield s.s.), while Bordenave (unpublished) serves as a reference for the Guiana Shield s.s. (mostly above 50-100 m altitude).

The assessment of the vegetation / flora in the field will involve:

- sampling of the "natural" vegetation along one 200 m transect per location pre- selected on the basis of the a priori landscape assessment (away from existing roads or tracks);

- sampling of converted habitats along one or more 50 m transects, specifically of secondary vegetation along existing roads and tracks; in principle, a converted plot will always be associated with a nearby "natural" transect (to allow for site- specific assessments of the effect of conversion);
- targeting woody plants (trees and larger shrubs and lianas, with stem diameter > 5 cm) and plant groups with species "of concern", i.e. species that are red- listed by IUCN or listed on CITES Appendix I or II;
- making use of the expertise of an experienced field botanist / tree- spotter for the identification of woody plants, and of a flora specialist for additional species recognition and, if required, the collecting of fertile voucher specimens; and
- (digital) photographic documentation of the vegetation observed and plants of which vouchers are collected.

Voucher specimens will be prepared and identified in Suriname by BBS, to the extent possible. *A posteriori*, we will evaluate the performance of BBS in terms of plant voucher identification. If required, voucher specimens can be sent to e.g. the Cayenne Herbarium (in French Guiana) for identification or confirmation.

To support the field work and get a more complete listing of the flora of the area, collection data of "old" specimens in the Suriname Herbarium (BBS) will be compiled. Old specimens are those collected and identified prior to our field work; these specimens are referred to in the BBS card system.

The processing of the transect survey data will involve:

- making structure graphs – based on species identity and size data, a graph will be made that shows the individual trees and liana's diameters on the Y axis and the height on the X axis; such graphs visualize the identity and distribution of the young and mature trees, of canopy height and of the presence and identity of very large and emergent trees;
- calculating Family Importance Values – Family Importance Value indices (FIV; see Mori et al. 1987) will be calculated, based on the transect inventory data; FIV indices are used to compare forest composition; the FIV index reflects, and is the sum of: i) relative dominance (linked to the tree size), ii) relative abundance (linked to the number of individuals), and iii) relative diversity (linked to the number of species); importance indices are calculated for each botanical family; the FIV indices reflect both qualitative and quantitative aspects of the various tree families;
- listing species - the species recorded from the transects are listed based on the Family they belong to and their Latin species name; and
- drafting of a vegetation typology – the diversity of the vegetation is presented by distinguishing, ordering and briefly describing the different vegetation types; this is based on the interpretation of the processed transect data.

The draft vegetation typology will be finalized by reconciled is, as much as possible, with existing typologies for Suriname and French Guiana. The plant list resulting from the transect inventory will be supplemented with the plants that were collected by us opportunistically (e.g. outside of the transects). The IUCN and CITES status of the plants listed will be checked and annotations will be made if species are "of concern" (e.g. endangered). Based on interviews with local inhabitants social and cultural valuable species will also be identified and analyzed.

Deliverables from the surveys will include vegetation maps, plant community type map, and critical habitat maps.

2.1.5 SOIL STUDIES

Approximately 20 soil samples will be collected from representative locations throughout the impacted area to characterize soil conditions and provide data to support mine closure and restoration. Composite samples will be collected from a depth to 0-20 cm below ground using a hand core sampler, garden trowel, or shovel. The sampling probe, trowel, or shovel will be cleaned prior to sample collection in accordance with established procedures. Approximately 500 grams of soil will be collected and placed in plastic bag (ziplock) or sample bottle and packaged for shipment to the laboratory. The final selection of soil laboratory will be made prior to collecting soil samples. Sample locations will be noted in the appropriate log book and sample location map.

It is anticipated that the following will be investigated (for 20 samples):

- Moisture content
- pH- H2O
- Particle size (sand, silt, clay)
- Organic C (Walkley & Black)
- N- Total
- P- Total
- P- Bray (Available P)
- CEC- effective
- Exchangeable Aluminium

2.1.6 FAUNA STUDIES

The sections below discuss some of the key fauna studies that will be conducted. ERM understands that Newmont's goal is a net improvement in biodiversity (in line with International Finance Corporation Performance Standard 6) and that this may be achieved through restoration of streams degraded by small scale mining, as well as reclamation of mine disturbances at closure.

Aerial Fauna Studies

Birds Study

The aim of the bird study will be to arrive at a more complete overview of the bird diversity at the site, and to assess if there is use of the Project area by species of elevated conservation concern. The ornithological expertise of the specialist involved in this study, in combination with existing bird and bat distribution maps (e.g. Digital Distribution Maps of the Mammals / Birds of the Western Hemisphere), allow for an *a priori* assessment of the species to be expected in the study area.

Field recording of birds at selected locations in the study area will be done during field trips to the Mine Site. The locations will coincide with the ones where habitats and vegetation will be assessed. However, additional locations for bird observation will in all likelihood be used, along 1-2 km long transects.

The field recording of birds will involve:

- visual and aural (song) recording of birds; and
- recording at the roadside and several hundred meters along a trails away from the roadside;

- opportunistic netting and collecting in case the identity of species observed is in doubt; and
- (digital) photographic documentation of birds netted or collected, and if possible of some of the birds observed.

We propose two bird survey events (one during the wet season and one during the dry season), each will be approximately one-week long and will include surveying multiple locations and transects. Some additional information on bird occurrence in the area will be obtained from interviews with local people (see section on large mammals, below).

Desktop Activities

The bird list resulting from our inventory will be supplemented with the names of birds that have been previously observed in the Mine area. The IUCN and CITES status of the species listed will be checked and annotations will be made in case species are of concern (e.g. endangered) and / or suspected to be un-described or RRE.

Terrestrial Fauna Study

Large Mammals and Marsupials

The aim of the large mammals and marsupials study will mainly be to arrive at a more complete overview of the large mammal and marsupial diversity at the Mine Site, and to assess if endangered species occur there, and if so, where. Large mammals can be operationally defined as those weighing more than 1 kg (on average).

Marsupials are pouched mammals whose babies are born in a very undeveloped state; the young then attach themselves to their mother's nipple. Many Marsupials have a pouch that encloses the young e.g., kangaroo.

To predict the presence of large mammals and marsupials in the Project area, existing distribution maps will be used (e.g. Digital Distribution Maps of the Mammals and marsupials of the Western Hemisphere). Pre-existing information on the mammals and marsupials actually observed at the Mine Site are available through the motion sensor camera studies. Trapping of mammals and marsupials is not an option, nor is the extensive recording of larger mammals and marsupials along trails, although we will develop and implement a protocol for the opportunistic recording of mammals and marsupials by our entire field team members.

Comprehensive information on mammal and marsupial occurrence will be obtained by interviewing local people that live, work and / or hunt in the general area. We intend to interview Maroons who live in villages and camps in the lowlands, and possibly also Brazilians that are involved in mining activities in the lowlands. These interviews will focus on game species and species collected for the wildlife trade, which are usually the best known locally, as well as the most valuable and often also the most endangered species. During the interviews, feedback will be requested on a list of some 90 animal species that may occur in the larger area, mostly large mammals and marsupials. Each species on the list will be mentioned to the informant by its local name, described in the Dutch Pamak or Sranan Tongo language if required, and illustrated by showing colour drawings if there is any remaining doubt.

We will compile a list of all large mammals and marsupials that have been recorded previously in the Project Area, that have been recorded by our team, and that were confirmed by local inhabitants. The IUCN and CITES status of the species listed will be checked and annotations will be made in case species are "of concern" (e.g. endangered).

Smaller Mammals

Although the larger, charismatic mammals such as monkeys and cats are relatively well known, the smaller mammals (bats, rats, and opossums) account for approximately 80% of the total mammalian species diversity in the lowland tropical rainforests of South America. A combination of high species diversity and relative abundance make small mammals a good indicator and reference group for studying environmental impact. In contrast, the large mammals are typically the species that are on the IUCN Red List of Threatened Species and CITES as endangered. These two groups of mammals are good complements for establishing baseline data that will be useful for assessing environmental impact and monitoring changes over time.

At least 2 or 3 sites will be surveyed for mammals. Small mammal survey methods include live traps set on the ground and in trees to sample both the terrestrial and arboreal rats and opossums, and mist nets set in the forest for sample bats. Large mammal survey methods will be based on a combination of camera traps, visual observations, and interviews with local inhabitants.

The identification of large mammals is easier than for small mammals because they are better known and there are fewer species. In general, visual confirmation of species is possible for large mammals by sightings or photographs. In contrast, some groups of small mammals need more detailed examination and comparison of museum voucher specimens and analysis of DNA variation. A reference collection of small mammals will be deposited at the University of Suriname's National Zoological Collection of Suriname, and the Royal Ontario Museum as documentation of the biodiversity in the area to ensure scientific veracity, and will be available for research to the international community. Baseline data derived from this material will include the estimation of species diversity and relative abundance of mammals. This information will be useful for establishing a long term monitoring project to track changes over time. Comparisons can also be done with similar studies in areas such as Brownsberg Nature Park, Bakhuis Mountains and Kwamalasamutu in Suriname, and Iwokrama Forest in Guyana. Likewise, the mammal survey results can be contrasted with the other terrestrial groups for an integrated synthesis of the faunal component of the ecosystem.

Amphibians and Reptiles

The aim of the amphibian and reptile study will mainly be to arrive at a more complete overview of the diversity at Mine Site, and to assess if endangered and potentially new (undescribed) or restricted range endemic (RRE) species occur there, and if so, where.

Field sampling at pre-selected locations in the study area will be undertaken during the rainy season and the dry season.

The field sampling of amphibians and reptiles will involve:

- Visual and aural (song) recording of species during both night and day;
- Sampling of species that require further identification in the lab;
- At each location, recording / sampling along a trail of ca. 1-1.5 km in length; and
- (digital) photographic documentation of amphibian and reptile species observed (if possible) and certainly of those collected.

Some additional information on Amphibia and reptile occurrence will be obtained from interviews with local people (see section on large mammals, below).

The Amphibia and reptile list resulting from our inventory will be supplemented with the names of Amphibia and reptiles that have been previously observed in the Project

area. The IUCN and CITES status of the species listed will be checked and annotations will be made in case species are of concern (e.g. endangered) and / or suspected to be undescribed or RRE.

Insects

The aim of the insects study will be to arrive at a more complete overview of the diversity at Mine Site, and to assess if endangered and potentially new (un-described) or restricted range endemic (RRE) species occur there, and if so, where. Most insects can easily be recognized to order, such as Hymeniptera (bees, wasps, and ants) or Coleoptera (beetles). However, insects other than Lepidoptera (butterflies and moths) are typically identifiable to genus or species only through the use of identification keys and monographs.

Field sampling at pre-selected locations in the study area will be undertaken during the rainy season and the dry season.

Some additional information on insect occurrence will be obtained from interviews with local people (see section on large mammals, above).

The insect list resulting from our inventory will be supplemented with the names of insects that have been previously observed in the Project area. The IUCN and CITES status of the species listed will be checked and annotations will be made in case species are of concern (e.g. endangered) and / or suspected to be undescribed or RRE.

The draft ToR for the Merian ESIA specifically mentions Lepidoptera (butterflies & moths) and Hymenoptera, which are two of the larger insect orders, each with likely several tens of thousands of species in Suriname alone (if not more). Insects, most of which are terrestrial, are very diverse in terms of number of taxa (groups) / species, life history, and ecology. From a practical standpoint, a selection of taxa must be made.

Within the Lepidoptera, the Nymphalid butterflies (family: Nymphalidae) are the best known and most amenable to observation in the field, standardized sampling and identification. Nymphalid adults are day active and most are attracted to ripe / rotting fruit. It is proposed to inventory Nymphalid butterflies that are active in the forest understory, forest edges and in open habitats (larger non forest habitats). An advantage of the study of Nymphalidae is that their ecology is relatively well known, and that there have been a number of studies on the impact of e.g. logging on the Nymphalid fauna that can serve as a reference for the baseline and expected impacts at Merian.

Within the Hymenoptera, it is proposed to study bees (Apoidea), the best known of which are the Orchid Bees (Apidae: Euglossinae) and the Stingless Bees (Apidae: Meliponinae). These bees are important pollinators. An additional important group of bees are the Apinae or (stinging) Honeybees, with only a single, but very important species in Suriname, which is an invasive alien species. Euglossinae, Meliponinae and Apinae are amenable to observation in the field, standardized sampling and identification. An advantage of the study of these bees is that their diversity and natural history is relatively well known, and that there is baseline data available from disturbed and undisturbed locations in Suriname that can serve as a reference in relation to Merian.

It is proposed here to also consider Coleoptera, the insect order with the largest number of known species, more specifically dung beetles. Most dung beetles belong to the family Scarabeidae, which is a diverse and relatively well known beetle family. The dung beetle fauna depends largely on the dung of (large) mammals; the state of the dung beetle fauna thus reflects the state of the mammal fauna, which includes several CITES Appendix I & II and CITES Red Listed species.

It is also proposed here to study ants, which are difficult to identify to species level, but can be studied at genus level for purposes of impact assessment. At the genus level, ants that are active at the soil surface are useful indicators of habitat conditions, and for instance in Australia, they are regularly used in rehabilitation monitoring studies.

Observations and samples will be obtained in different habitats in the study area, both in areas where habitats conversion is planned and areas where no such conversion is planned. The following types of habitats will in likely be sampled:

- un / less disturbed forest habitats (e.g. swamp forest / creek forest, dryland forest on slopes and hill tops);
- (old) secondary forest habitats (forest recovered from clearing);
- non forest habitats resulting from forest clearance (recent conversion); and
- forest edge habitats (where forest and non forest habitats meet).

The following zones will be targeted (with reference to map in Terms of Reference Figure 7-1), all within the Surgold Merian concession, except when otherwise indicated:

- Zone 1 with 2 large proposed mine pits in N half of study area;
- Zone 2 with 2 small proposed mine pits in S half of study area;
- Zone 3 with proposed waste rock storage;
- Zone 4 with proposed tailings storage;
- Zone 5 with proposed new road section (large part outside concession); and
- Zone 6 in un/less disturbed NW part of concession.

Zones 6 will be a reference area in which habitats are expected to occur that are currently undisturbed (or at least less disturbed). This reference area is expected not to be directly affected by the proposed Surgold operations, and may serve as control for future monitoring.

Nymphalid butterflies will be observed and collected with insect nets during the long dry season (August – November), when they are most active. Fruit baiting stations will be used to attract the butterflies and augment the survey. The butterflies will be sorted and provisionally identified in Suriname; a synoptic collection will be sent to a specialist for definitive ID. Euglossine bees will be attracted with chemical baits, and Meliponine and Apine bees with sugar water, honey and/or salt solutions; they will be captured with insect nets. This will be done after the long dry season, i.e. when Euglossine activity becomes high after a distinct low during the long dry season itself; ideally between January and April. The bees will be sorted and identified in Suriname; a synoptic collection will be sent to a specialist for confirmation of the IDs. Dung beetles will be attracted and collected using traps baited with human faeces. This will be done after the long dry season, i.e. when dung beetle activity picks up after the distinct low of the long dry season. The beetles will be sorted and provisionally identified in Suriname; a synoptic collection will be sent to a specialist for definitive ID. Ants will be collected using pitfall trap arrays (without baits). This will be done during the long dry season when the chance of negative impact on the trapping due to inclement weather is low. The ants will be sorted and identified to genus level in Suriname. They will be sent to a specialized institute for further processing (at a later stage, and beyond the scope of this ESIA).

In relation to the various taxa (groups) mentioned above:

- Species lists will be compiled (genus in case of ants);
- Species accumulation curves and diversity estimates will be made (not for ants);
- Any alien / invasive species will be identified (genera for ants);

- Taxa / species indicative of disturbance will be identified;
- Any restricted range endemics (RRE) will be identified (not for ants); and
- Any CITES or IUCN Red Listed species will be identified (not for ants).

Most of the insect specimens obtained (except ants) will be pinned and dried in the lab in Paramaribo, and will be permanently stored at the National Zoological Collection of Suriname.

Fish and Aquatic Baseline Studies

This study will characterize the fish and aquatic community of potentially affected streams in and near the Mine Site. The field study for the ESHIA will not sample every stream at the Mine Site, but will include several streams from each major watersheds and the full range of aquatic habitat conditions (velocity, water quality, substrate conditions, vegetated vs. non-vegetated, etc.) present in the streams. We will conduct a wet season and a dry season survey using nets and/or electroshock techniques.

The fish will be identified and any rare or endemic fish, as well as fish used as a subsistence food source noted. We will conduct fish tissue analysis to document baseline metal concentrations, especially for key metals expected in the seepage from the waste rock dumps and tailings basin.

Tropical streams, including those in Suriname, are known for their large hydrological variation (discharge, water level) related to seasons (and El Nino years). This variation in discharge in turn results in variation in suspended and dissolved solids (including nutrients), phytoplankton densities etc. The habitat of fishes can also be dramatically different under low and high-water conditions (e.g. flooded forest). To arrive at meaningful baseline data it is thus important to sample the streams at least during

both the low-water and high-water season (e.g. end of long dry season,

November- December, and end of long rainy season, July- August). Fish and phytoplankton/periphyton communities and habitat diversity can be sampled most effectively in the dry season. Thus two sample periods are proposed.

The Merian Concession includes creeks that are part of the Commewijne River system and (more) creeks that are part of the Marowijne River system. Streams in both the Marowijne and Commewijne catchments have to be sampled as they may differ in fish fauna. The main stream in the Concession is the Merian Creek which is part of the Marowijne River system. It is important to identify/sample control stream(s) that will not be impacted by the gold mine (i.e. situated outside the concession) and that are

preferably also not impacted by small- scale gold mining in the area.

We propose to sample:
1. Basic water quality (Secchi disc transparency, TSS, conductivity, temperature, pH, Dissolved Oxygen); long term data of these parameters and cyanide, NH3, NO3 and phosphorous data should be provided by Surgold.
2. Habitat diversity based on Gorman & Karr (1978), i.e. bottom sediment, water depth and velocity.
3. Phyotoplankton/periphyton
4. Fish community structure (species diversity, abundance)
5. Fish muscle tissue samples for heavy metal analysis (piscivores and other large food fishes)
6. (optional) macroinvertebrates (which are consistent taxon biomonitoring rather than fish or periphyton/phytoplankton)

Sample stations to be identified after reconnaissance, but include two stations on

Marowijne River, two stations on Merian Creek, two stations on control stream, station(s) in Commewijne watershed.

The fish and phytoplankton (and macroinvertebrates) will be identified and any rare or endemic fish, as well as fish used as a subsistence food source noted. We will conduct fish tissue analysis to document baseline metal concentrations, especially for key metals expected in the seepage from them waste rock dumps and tailings basin. In addition metal concentrations in fish tissue will help to demonstrate baseline levels of metal already existing due to small scale mining activity, prior to any project activities.

Some initial fish surveys have been conducted so as to provide context of existing aquatic life. These will supplement the proposed baseline surveys.

2.2   *SOCIAL BASELINE STUDIES*

The social baseline studies include three interrelated aspects:
- Socio-economics
- Community health
- Tangible and intangible cultural heritage

A team of specialists along with local sub consultants will undertake the baseline studies. Based on our prior knowledge and previous work with Newmont our key study area for this component will include the ten Pamaka villages, namely:

- Akaati
- Atemsa
- Bada Tabiki
- Kiki Mofo
- Langatabiki
- Loka Loka
- Nason
- Pakira Tabiki
- Skin Tabiki
- Tabiki Ede

In addition to the above, communities affected by the transport corridor which will included based on the outcomes of a traffic assessment (for traffic survey methodology please see *Annex B*). The transport corridor will run from the port at Niuewe Haven along the Paramaribo to Moengo road, and south at Moengo along the Moengo to Langa Tabiki road.. This may include the communities of Pilgrim Kondre, Mora Kondre, Abadu Kondre etc. The baseline study will also include any small scale mining (pocknocking) camps within the geographic scope.

In addition, depending upon the results of a scoping assessment of Tempatie Kreek and the Commeweijne River as well as some hydrological modelling, villages in this area may be included such as the Ndjuka communities of Java, Penica, Mapane, Moengotapu, Awara, Potehede, Stronkampu, Grankop and Moisimoisi, however preliminary scoping assessments indicate that this is unlikely.

As appropriate, the project team will undertake a combination of qualitative interviews and quantitative surveys of local communities/households, local decision makers/community leaders, potentially marginalised groups, local NGOs, government authorities. This will be supplemented by focus group meetings to determine concerns and expectations in relation to Newmont's activities in the area.

Data collection will use participatory rural appraisal (PRA) techniques such as resource mapping and focus group discussions. This will be supplemented with a household socio-economic sample survey in the communities to inform the baseline. Suralco's (who have a Bauxite project approximately 20km south of the Merian Project) recent household survey results within the communities along the Maroweijne River will be used and supplemented with additional data where necessary. The results of this survey are considered to be appropriate source material due the overlap in geographic scope and the short timeframe that has elapsed since their completion.

The purpose of the socio-economic study is to establish a detailed understanding of the characteristics of the communities within the geographic scope of work. The socio-economic baseline will have the following type of indicative content:

- Demographic profile (age, gender, family structure etc);
- Housing conditions and distribution of settlements;
- Occupational profile, including employment and livelihood status (job – if applicable, sources of income, livelihood strategies);
- Income profile;
- Education (all levels, including vocational training);
- Religion;
- Race and ethnicity (including indigenous populations, languages);
- Land use and ownership;
- Access to public services and utilities (electricity, sanitation, water, health services, information and communication technology);
- Sources and use of energy;
- Study of resource-based livelihoods concentrating on the use of land and resources – especially through cassava cultivation, hunting and fishing -- for subsistence and income generation
- Study of land use (planning controls, access to land, land rights, history of land use patterns – when areas under cultivation came into cultivation, when specific land tilled)
- Study of water use
- Vulnerable people's assessment
- Living cultural heritage and community usage of sacred sites e.g forests

The implementation of the Community Specialist Study will be undertaken by ERM's Public Health lead and/or epidemiology professionals including experts from universities or NGOs. Key health issues for further study may include malaria transmission; mercury poisoning from the small scale mining activities; health infrastructure capacity and access; and indigenous health practices.

Depending on the information gathered during the Scoping Task and a determination of what is relevant to the ESHIA, this may include:

- Vector-related disease
  - o Incidence and prevalence of malaria, typhus and dengue
- Sexually transmitted infections
  - o Prevalence of prostitution
  - o Incidence and prevalence of HIV/AIDS and other sexually transmitted infections (STIs)
- Consumption and nutrition-related issues
  - o Changes in subsistence practices
  - o Rates of malnutrition
  - o Incidence of alcohol and drug abuse
- Accidents and Injuries
  - o Traffic and road related incidents/deaths
  - o Construction accidents/deaths

- Exposure to potentially hazardous materials
  - Respiratory complications from air /dust pollution
  - Consumption of contaminated water sources (including mercury)
- Cultural health practices
  - Role of traditional medical providers, indigenous medicines or unique cultural health practices
- Health systems infrastructure and capacity
  - Physical infrastructure
  - Staffing and technical capabilities of health care facilities at local, district and provincial levels
- Access to health services
  - Prevalence of vaccinations/immunizations by local population
  - Access to primary and tertiary health services by the local population

Examples of the household survey and preliminary interview / focus group guides are available in Annex A.

2.3   DESKTOP STUDIES TO INFORM THE ESHIA

ERM understands that some information that would be needed to complete the baseline sections of the ESHIA currently exists and would be provided by Newmont and/ or Golder to support the development of the ESIA. Such information includes Transport Routes, , geologic characterization and mapping data, mine geochemistry data, and results of the Biodiversity Tool.

Geology

ERM does not propose any additional geologic field studies, but will draw on the exploration work and geologic characterization and mapping that have already been completed by Newmont. This information will be summarized in the ESHIA.

Geochemistry

Newmont has already conducted extensive characterization of the mine geochemistry, including the potential for acid rock drainage (ARD) and the likely water quality constituents of seepage from the waste rock dump and tailings basin. ERM will not conduct any additional geochemical studies, but will use the available information as inputs for water quality modelling. Mine geochemistry and predicted surface and groundwater quality during operations and closure will be discussed in the ESHIA.

Ground and Air Vibration Assessments associated with Mine Blasting

To determine the ground vibration and air vibration (airblast overpressures) effects of mine blasting at existing gold mines within the Surgold concession, ERM will perform baseline ground and air vibration calculations using desktop models. The computations would be based on information provided by Newmont regarding explosives required for blasting (explosive type, charge mass per hole), blast-hole diameter, and burden or stemming height. Since the proposed Project would also include mine blasting, ERM will also use desktop models to compute and assess the project-related ground and air vibration effects of mine blasting at the proposed gold mine. The ground vibration levels (peak particle velocity) and air vibration (Linear decibels) levels will be compared with applicable international standards such as the New Zealand Environment and Conservation Council (ANZECC) guidelines – *Technical Basis for Guidelines to Minimize Annoyance due to Blasting Overpressure and Ground Vibration, dated 1990*. The Mine Engineer will be responsible for ensuring mine features (e.g., tailings dam, worker village) are appropriately designed to withstand project-related vibration.

Natural Hazard Studies

ERM will address the potential for natural hazards affecting the project area in the ESIA. These natural hazards include flooding, hurricanes, seismic events, and induced geo-technical issues. The potential for flooding will be assessed semi-quantitatively by determining recurrence intervals for large storm events based on the available meteorological data. Since the project straddles a ridge line, we do not believe flooding is a real concern, but large storm events can affect overall mine water management. ERM will coordinate with the mine engineer to ensure large-storm water management is included in the mine design. Suriname is a low hazard area in terms of hurricanes and seismic events. ERM will address the potential for these issues based on literature probability values.

Large rainfall and other events can create geo-technical issues, especially with the tailings dam and other engineered structures. Although the design engineer will be responsible for ensuring adequate mine design, ERM will address the potential for geo-technical issues (e.g., tailings dam failure, slope slumping) in the ESIA.
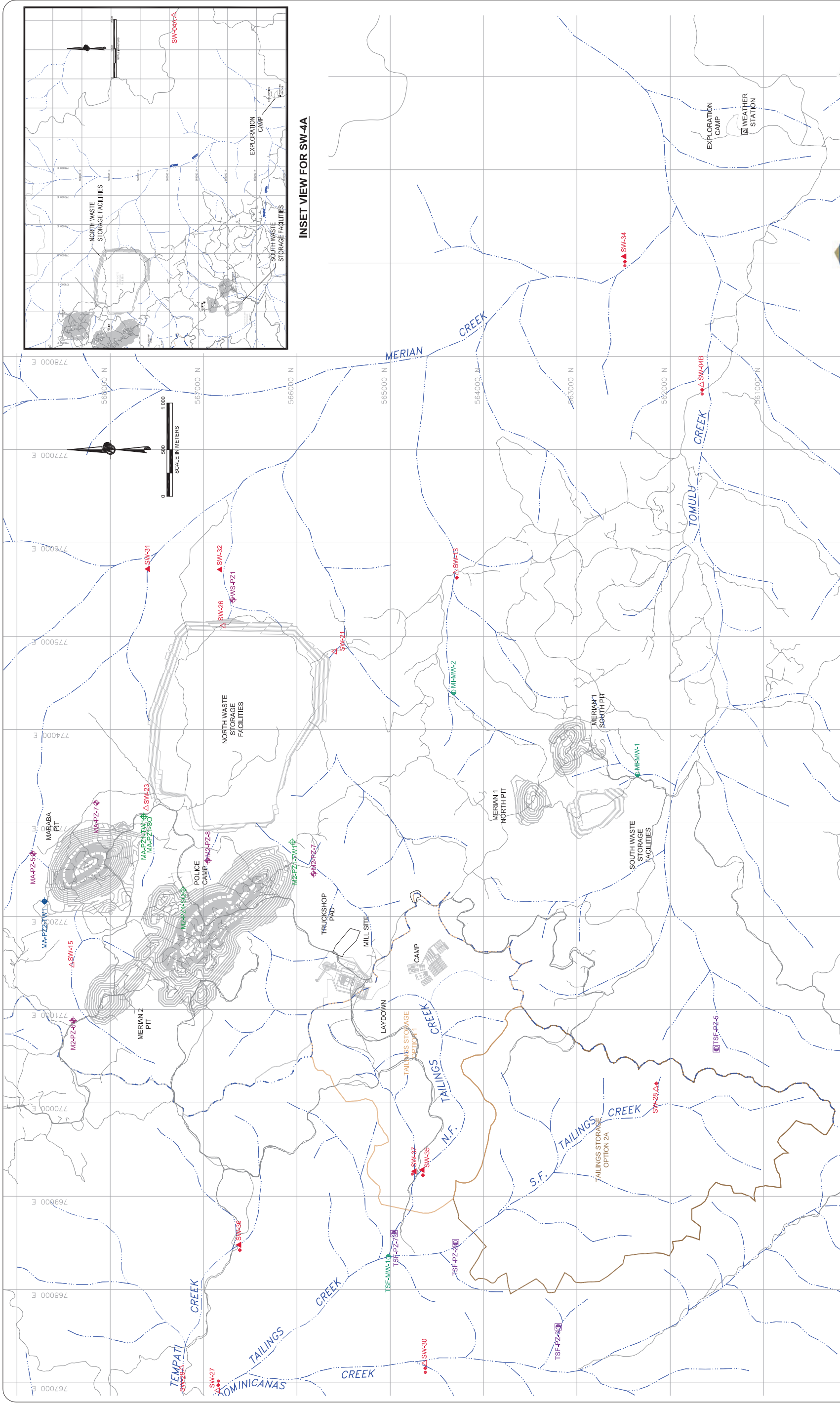
Visual Impacts

The project is in a remote area that is approximately 20 km from the nearest road or residence. It is surrounded by tall forest. Therefore, we believe the project's potential for visual impacts is minimal. ERM will conduct a desktop assessment of the potential for visual impacts, including identification of any potential sensitive viewpoints (e.g., potential for waste rock dumps to be visible from any off-site locations) and to generally characterize these visual effects. This visual assessment will also address the visual appearance of the mine site at closure.

Carbon Footprint Study

ERM will conduct a carbon footprint of the existing study area using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The study will evaluate the value of undisturbed native forest by accounting for the existing carbon stock (sequestered carbon) in each vegetation type (both above ground and below ground biomass) within the study area and determine the carbon loss in the form of carbon dioxide that would result from deforestation activities at the mine site. The study will also account for carbon losses to the atmosphere from anthropogenic sources during project construction and operations (e.g., burning of fossil fuels from mine equipment and vehicles and power plant).

Figures

PROPOSED WATER RESOURCES
MONITORING PROGRAM
SURGOLD PROJECT, SURINAME

FIGURE 1

DRAFT

ERM

Golder Associates

NEWMONT

INSET VIEW FOR SW-4A

SCALE IN METERS
0   500   1,000

EXPLORATION LEGEND:

MA-PZ2-TW   DAMAGED/DESTROYED TEST WELLS (TO BE REPLACED)
M2-PZ2-10   PROPOSED PIEZOMETER OR TEST WELL
MI-MW-1   PROPOSED MONITORING WELL
TSF-PZ-5   PROPOSED PIEZOMETER NEST AND TEST WELL
M2-PZ1-TW1   EXISTING MONITORING WELL
SW-29   EXISTING SURFACE WATER QUALITY SAMPLE
SW-30   PROPOSED SURFACE WATER QUALITY SAMPLE
             — WITH STREAM GAUGE
             — WITH TURBIDITY MONITORING

FACILITIES LEGEND:
            PIT SAFETY PERIMETER
            RIGHT OF EXPLOITATION
            PROPOSED ACCESS ROAD
            SECONDARY ROAD

TOPOGRAPHY LEGEND:
            STREAM (APPROXIMATE)
            EXISTING ROAD
            FORESTRY ROAD
            COMMON/MINE-AREA/OWLINE WATERSHED DIVIDE
            TAILINGS STORAGE FACILITY (OPTION 1)
            TAILINGS STORAGE FACILITY (OPTION 2A)

SOURCE:
1. FACILITIES GEOMETRY FROM G-MINING, AUTOCAD FILE NAME: SITE GENERAL ARRANGEMENT.dwg, DATED AUGUST, 2011.
2. TOPOGRAPHY FROM LIDAR-GENERATED DATA, DATED AUGUST, 2011.

NOTES:
1. FOUR ADDITIONAL MONITORING WELLS WILL BE INSTALLED. LOCATION ARE TO BE DETERMINED.
2. ELEVATIONS AND COORDINATES IN METERS.
3. GRIDS REFERENCED IN WGS 84 COORDINATES SYSTEM.
4. THE PRESENT DRAWING CONTAINS CLASSIFIED AND CONFIDENTIAL INFORMATION.
5. SW23 WILL BE REPLACED BY SW31.
6. SW26 WILL BE REPLACED BY SW32.

Appendices

Annex A

Qualitative Social Surveying Interview Guides

INFRASTRUCTURE MAPPING: INTERVIEW GUIDE

1. **Health**

1.1 Health Infrastructure
- *Who is the main provider of health services? (public/private?)*
- *Generally how many people access public health services*
- *Generally how many people access private health services*
- *How many health centres are in the area? Where are they?*
- *What is the patient capacity in each of these health centres?*
- *How many hospitals are in the area ? Where are they?*
- *What is the patient capacity in each of these hospitals (hospital beds)?*
- *What level of care is provided in the health centres and hospitals (i.e. emergency care, maternal care, level of treatment for illness/disease, medicines/operations available)*
- *How many doctors are there in Moengo?*
- *What is the doctor-patient ratio?*
- *How many nurses are there in Moengo?*
- *How many ambulances/paramedics?*
- *What is the area serviced by ambulances/paramedics?*
- *What is the level of knowledge/education about disease prevention and care?*
- *Who is health education provided by?*
- *How many people access health education facilities?*

1.2 Health Status
- *What are the typical types of illness people suffer from? (Elderly, men, women, children)*
- *What are the levels of communicable diseases*
- *What are the levels of HIV/AIDS and other STIS?*
- *What are the levels of malnutrition/obesity?*
- *What is the level and pattern of drug and alcohol use? (Elderly, men, women, children)*
- *What are the common sicknesses / illnesses?*
- *What are the common causes of death?*
- *What is the level of knowledge/education about drug/alcohol use?*
- *What is the maternal mortality ratio?*

2. **Education**

2.1 Educational Facilities
- *Is education provided publicly or privately?*
- *Are there entrance requirements to attend schools?*
- *What is the official teaching language in schools?*
- *How many schools are there (primary/secondary)*
- *How many students/classrooms/teachers/teachers aids in each school?*
- *Where are the schools located?*
- *How do students go to school?*
- *What is the average distance travelled by students to attend school?*
- *What facilities/resources are provided by schools? (Libraries, IT, sport, music, pens/papers?)*
- *What are the costs associated with attending school (fees, uniform, textbooks, travel etc)*
- *What facilities are there for providing vocational training?*

2.2 Educational Status
- *What is the quality of education provided?*
- *What is the average school leaving age? (girls/boys)*
- *What are average literacy rates (elderly, men, women, children)*
- *What is the usefulness of education for employment purposes?*
- *What vocational training is available for residents?*

3. Infrastructure Availability

3.1 Water and Sanitation
- *What is the level of access to clean water?*
- *What is the main source of water?*
- *What is the capacity and quality of the sewage system?*
- *What are the main sources of water usage? (household, business, industry, farming)*

3.2 Waste Management
- *What is the quality and capacity of waste management facilities?*
- *What are the average volumes of household waste?*
- *How is waste managed? (burning / collection etc.)*

3.3 Housing
- *What is the level of access to adequate housing?*
- *What amount of housing is available?*
- *What is the general quality and type of housing?(Description of housing stock available)*
- *What has the average rate of build of new housing been over the past 5 years?*
- *What materials are used in housing construction?*
- *What is the average cost of housing?*
- *What are housing planning requirements?*
- *What are property rights?*

3.4 Electricity
- *What is the level of access to electricity?*
- *What is the main source of electricity generation?*
- *What is the cost of electricity?*
- *What is the capacity of current power generation?*
- *What is the frequency of power cuts?*
- *What is the cost of connecting to the national grid?*
- *Who is the main electricity provider/regulator?*

3.5 Judiciary and Prison Services
- *What is the prison capacity*
- *What is the size of the local courts? (number of judges, lawyers, court rooms)*
- *What is the average waiting time before trial?*

3.6 Emergency Services
- *What is the size and jurisdiction of the police and fire services?*
- *What resources do the police and fire services have?*

3.7 Other
- *What additional goods/services are provided by local government?*

- *How are these services paid for?*
- *Who has access to these services?*
- *What additional goods/services are provided by the private sector?*
- *How many churches/religious institutions are there?*
- *What other groups/associations are present in the town (e.g. church groups, farmers groups, women's groups)*

4. Socio-Economics

4.1 Employment
- *What is the level of unemployment?(men/women)*
- *What are the biggest employment sectors/major livelihoods?*
- *Are there differences between ethnicities?*
- *What is the average number of people (%) in*
  - *Farming*
  - *Trading*
  - *Hunting*
  - *Fishing*
  - *Small-scale mining*
  - *Tourism*
  - *Handicrafts*
  - *Formal employment*
- *What is the average wage?*
- *What is the level of child labour?*
- *What are the main goods traded?*
- *Which goods/food products are imported and which are locally produced?*

4.2 Standard of living and poverty
- *Has the standard of living changed (better of worse) over the past 5 years?*
- *What aspects have changed and what are the reasons for this?*
- *What is the average cost of a basket of goods?*
- *What is average household income and expenditure?*
- *What is the level of poverty?*
- *What groups/areas of the town are the poorest and why?*
- *What groups/areas of the town are the most affluent and why?*
- *What are the most vulnerable groups?*
- *Are there any food shortages?*

5. Demographics

5.1 Population
- *What is the total population?*
- *What is the population distribution? (age, gender, ethnic groups)*
- *What is the population of each ethnic group?*
- *What is the number of households?*
- *Average number of people per household?*
- *What is the historical/current population growth rate?*
- *What are the main languages spoken?*

5.2 Migration
- *What is the historical/current level of migration*
- *What is the main demographic group of immigrants? (age/gender/ethnicity)*

- *What are the land/property/employment/education rights of immigrants?*

5.3 Crime and Punishment
- *What is the crime rate? (petty theft, violent crime, rape, murder)*
- *Where are suspects held and tried?*
- *Where are prisoners held?*
- *What are sentencing policies?*
- *What is the current prison population?*
- *Has this grown over the past 5 years?*
- *What is the demographic split of the prison population (men/women/age groups/immigrants/ethnic groups)*

5.4 Conflict and conflict resolution
- *Are there any conflicts in the town?*
- *What is the nature of these conflicts and who are they between?*
- *Who is responsible for resolving these conflicts?*

5.5 Project Impacts
- *How will the project affect your community?*
- *What are your main concerns about this project?*
- *Who in your community would be the least able to cope with changes?*
- *What could be done to make sure the project does not damage your community?*
- *How would you feel about more industrial development in this area?*
- *How would their presence affect you?*
- *Any other comments / questions?*

FOCUS GROUP GUIDE – MEN

1. Demographics
- *Generally what are the roles of men?*
- *Generally what are the roles of women?*
- *What is the gender balance? Has this changed in the past three years?*
- *Have many people moved into/out of the village in the past three years?*
- *What are the reasons for this?*

2. Community Networks
- *What groups/associations exist in the community?*
- *What is the purpose/influence of these groups?*
- *Are you involved in any of the groups? If yes, which group and why?*

3. Cultural Significance and Sacred Sites
- *What are the sacred sites in and around the village?*
- *How are these accessed and how often are they visited?*
- *What would you expect the process to be for relocating these?*

4. Livelihoods
- *What are the major livelihoods?*
- *Which of these is the most profitable and which is the preferred form of livelihood?*
- *Are there differences between different ethnicities/age groups?*
- *Approximate number of people (%) in:*
  - *Farming*
  - *Fishing*
  - *Trading*
  - *Hunting*
  - *Small scale mining*
  - *Commercial activities*
  - *Formal employment*
- *How has this changed in the last 5 years?*

FOCUS GROUP GUIDE – VULNERABLE GROUPS

In your opinion what are the groups that are most likely to be the MOST vulnerable in your community (i.e. women, children, women in informal marriages, young pregnant girls)?

Who looks after these individuals? Do Elders get involved? What is the process?

1. **Health**

    - *Generally where do you seek medical attention (i.e. go to the doctor, see a healer)?*
    - *Why do you choose go to this facility (price, quality, availability)?*
    - *What town is the health centre in?*
    - *What are the typical types of illness people suffer from?*
    - *Has this changed in the past 5 years?*

    ### *Type of Illness*

Group of People	Types of Illness
Old people	
Young people	
Women	
Men	
Children	

2. **Household Food Security**

    - *Which foodstuffs are produced by the household and which are bought?*
    - *Why do you sometimes NOT produce enough food?*
    - *Usually, when does the food run out?*
    - *Are there any food shortages expected?*

3. **Standard of Living**

    - *How do you define a good standard of living (which factors are most important)?*
    - *Is your standard of living in this village the same, better or worse than it was three years ago?*
    - *What are the reasons for this (i.e. more people working, less people working, better infrastructure etc)?*
    - *What is average household income/expenditure?*
    - *Has the cost of living changed in the past three years? If yes why do you think this is?*

4. **Village Infrastructure**

    - *Number and quality of communal wells/pipe stands – and any other sources of water?*
    - *What is the quality of the water available is there enough for everyone?*
    - *What is the main source of electricity? (grid, generator, battery)*
    - *What is the main source of fuel for cooking? Where does it come from?*

- *Mosque/church buildings*
- *Graveyard/sacred locations*
- *Football/playing fields*
- *Number of restaurants/food sellers*
- *Village shops (types of goods sold)*
- *Permanent Market*

5. Transport and Communication

- *How is the village connected to other towns/villages (quality/type of roads/telecommunications)*
- *What is the main method of transport?*
- *What is the purpose/frequency of travel outside the village?*

6. Status of Education

- *School level (how many classrooms?)*
- *School location? How do students travel to school?*
- *Who provides education? (state/village?)*
- *What is the cost of education? (uniform, books/materials, fees, travel)*
- *How many pupils? Teachers? Teaching Aids?*
- *Quality of education in this village?*
- *Usefulness of education?*

7. Recreation

- *What is the main form of entertainment in the village?*
- *Do you travel outside the village for recreational purposes?*

8. Access to Land

- *Can everyone in the village, own land? If not why not?*
- *Who are the biggest land owners in the village?*

9. Project Concerns

- *What are your concerns about the project and how it will impact your village?*
- *What are the positive impacts of the project on your village?*
- *What are your expectations of the project? How do you think it can benefit/harm you?*

FOCUS GROUP GUIDE – WOMEN

1. **Demographics**

    - *What are the roles of women in the village?*
    - *What are the main roles of men in the village?*
    - *What do you do, when, in a day (starting from getting up what are the activities you complete in a day.)?*
    - *Are there any issues that women face that men do not?*
    - *Are women able to keep any money that they earn?*
    - *Who is in charge of household expenditure?*

2. **Community Networks**

    - *What groups/associations exist in the community?*
    - *What is the purpose/influence of these groups?*
    - *Are you involved in any of the groups? If yes, which group and why?*

3. **Water and Sanitation**

    - *What is the main source of water? How is it accessed and does it cost anything?*
    - *What is the quality of this water?*
    - *Are there any shortages of clean drinking water?*
    - *How/where is household waste removed?*

4. **Land Ownership**

    - *Do women own their own land? Or always work land with their father/husband?*
    - *If a marriage was to end what is current practice to distribute land?*
    - *If a woman is unmarried who does she live with?*

5. **Vulnerable Groups**

    - *In your opinion what are the groups that are most likely to be the MOST vulnerable in your community (elderly women, children, women in informal marriages, or young pregnant girls)?*
    - *Who looks after these individuals? Does the elder(s)/ Queen Mother get involved?*

6. **Health**

    - *Where do you seek medical attention (e.g. go to the doctor, see a healer)?*
    - *What is the cost of health care?*
    - *What is the most common reason for seeking medical attention?*
    - *Where do women give birth?*
    - *What is the average distance between your village and the health center (i.e. minutes walk/number of miles approximate)?*
    - *What is the most common type of illness? Has this changed over the past five years?*

Types of Illnesses

Group of People	Types of Illness
Old people	
Young people	
Women	
Men	
Children	

7. Household Food Security

- *Do you expect any food shortages?*
- *What kind of foods do you mostly buy/grow?*
- *How much of your income is spent on food?*

8. Standard of Living

- *How do you define a good standard of living (factors which are most important?)*
- *Is your standard of living in this village the same, better or worse than it was three years ago?*
- *What are the reasons for this more people working, less people working, better infrastructure etc.)?*
- *How could your standard of living be improved?*

9. Education

- *What is the standard of education in the village?*
- *How useful is formal education?*
- *Who runs the schools (state/village) and where are they located?*
- *What is the cost of education (fees, transport, uniform, materials)*

10. Transport and Communications

- *What is the main form of transport/communication outside the village?*
- *How frequently do you travel and what is the main purpose of travel?*
- *How much of household income is spent on transport?*
- *How much of household income is spent on communication?*

11. Household Expenditure and Savings

- *What are the top five expenditures you make every month?*
- *Do you save any money? If yes, what do you save for and how much do you save?*

12. Forest Products

- *What do you most often collect in the forest?*
- *What do you do with it (eat it/sell it)*
- *If you sell them, where do you sell them?*
- *What is the most valuable product you collect? (e.g. mushrooms/herbs)*
- *For how long would you be willing to walk in order to collect the products?*

13. Cultural Heritage and Sites of Significance

- *Are there any sites of significance in the village?*
- *What are they?*
- *Where are they?*
- *How are they accessed and how often?*
- *What would you expect to be the process for relocating them?*

14. Recreation

- *What are the main forms of entertainment in the village?*
- *Do you ever travel outside the village for recreational purposes?*

15. Project Concerns

- *What are your concerns about the project for the village?*
- *What do you think will be the positive impacts of the project for the village?*
- *What are your expectations from the project? How do you think it could benefit/harm you?*

FOCUS GROUP GUIDE – YOUTH

1. Demographics

- *Generally what are the roles of the youth in this village?*
- *What are the good things about this village?*
- *What are the bad things about this village?*
- *What kinds of training have you previously received?*
- *What kinds of training would you like to receive if that was a possibility?*

2. Community Networks

- *What groups/associations exist in the community?*
- *What is the purpose/influence of these groups?*
- *Are you involved in any of the groups? If yes, which group and why?*

3 Vulnerable Groups

- *In your opinion what are the groups that are most likely to be the MOST vulnerable in your community (women, children, women in informal marriages, and/or young pregnant girls)?*
- *Who looks after these individuals? Does the chief get involved?*

4 Health

- *Where do you seek medical attention (go to the doctor, see a healer)?*
- *How often and for what reason do you seek medical attention?*
- *What are the typical types of illness people suffer from?*

Types of Illnesses

Group of People	Types of Illness
Youth	

5. Standard of Living

- *What do you consider necessary for a good standard of living?*
- *Has the standard of living improved, decreased or stayed the same over the last 3 years?*
- *Why is this?*

6. Educational Facilities

- *What are the educational standards of local schools?*
- *What is lacking in the current educational infrastructure/personnel?*
- *What is the average school leaving age?*

- *How useful is formal education?*
- *How long do you spend travelling to school/in school?*

7. Livelihoods

- *How do the youth in the village make a living? How is this different to other men/ women in the village?*
- *Do you keep income earned or share it with family?*

8. Entertainment Availability

- *What forms of entertainment are available for you?*
- *Where can you access these?*

9. Project Concerns

- *What are your concerns about the project and how it will impact your village?*
- *What do you think are the positive things about the project and how it will impact on your village?*
- *What are your expectations from the project for you? (Benefits/harm it will bring to youth of the village?)*

FOCUS GROUP GUIDE – ELDERS

1. Brief History of the Settlement

- *Where did the community come from when and why?*
- *Why did they choose this location?*
- *Which ethnic group founded this village?*
- *Approximately what are the percentages of different ethnicities in this village?*
- *Has the ethnic mix of this village changed since it was founded?*
- *Has the population increased or decreased in the last 5 years, why?*
- *What is the gender balance in the village?*

2. Cultural Heritage and Sites of Significance

- *Are there any sites of significance in or around the village (ie sacred groves, graveyards etc.)?*
- *What are they?*
- *Where are they and how are they accessed?*
- *What would you expect to be the process for relocating them?*

3. Community Leadership

- *Who heads the village?*
- *How are they chosen?*
- *Name of paramount chief and where does he live?*
- *Who is the government representative in the village?*

4. Conflict and the Resolution of Conflicts

- *What types of conflicts are prevalent in the village?*
- *Who is responsible for resolving the different types of conflicts?*
- *Assuming there is a conflict that they are not able to resolve what happens then?*

5. Land Ownership

- *Who can own land?*
- *Who can inherit land?*

6. Types of Institutions and Networks

- *What are the groups/associations present in the community (eg. church groups, farmer groups, women's groups)?*
- *What is the history of these groups (when were they established, have they changed in size over past few years)*
- *What is the purpose and influence of these groups? (Benefits they bring/problems they cause in the village)*
- *Which neighboring community has close ties to this village?*
- *What is the nature of the relationship? How/why did it form?*

7. Health

- *Do you have any concerns regarding the health infrastructure/personnel?*

- *Where do people typically seek medical treatment from?*
- *What are the typical types of illness people suffer from?*
- *Has this changed in recent years?*

8. Standard of Living

- *How do you define a good standard of living (which factors are considered most important)?*
- *Is your standard of living in this village the same, better or worse than it was three years ago?*
- *What are the reasons for this (e.g. there are more people working, fewer people working, better infrastructure etc)?*
- *What groups of people in your community are the poorest and why?*
- *What groups of people in your community are the most affluent and why?*

9. Economic Activity

- *What is the main source of income in this village? (Agriculture, animal husbandry, hunting, fishing, small scale mining, formal employment, commercial activity, remittances)*
- *How has this changed in the past three years?*
- *What is the preferred form of employment?*
- *What is the most profitable form of employment?*

10. Education

- *What percentage of the village can read and write?*
- *Where do children/adolescents go to school?*

11. Transport/Communication

- *What is the main mode of transport to other towns/villages?*
- *How often to villagers travel to other villages/towns?*
- *What are the main purposes of travel?*
- *What is the main mode of communication to people outside the village?*
- *How many people in the village own a phone/radio/television?*

12. Health

- *What do you most often collect in the forest?*
- *What do you do with it (eat it/sell it)*
- *If you sell them, where do you sell them?*
- *What is the most valuable product you collect? (ie mushrooms/herbs….)*
- *For how long would you be willing to walk in order to collect the products?*

13. Potential Impact of the Mine

What do you feel are the positive impacts of the mine on your lives?

What do you feel are the negative impacts?

What are the 4 most important things you would choose to help develop your community? Can you prioritize these for me starting with the most important? Probe for training and skills development interventions as well as infrastructure.

Annex B

Traffic Survey Methodology

This Annex describes the procedures for counting traffic on the Paramaribo-Moengo-Langa Tabiki road, in support of ERM's ongoing work on Surgold's Merian project in Suriname. Traffic counts will help to better characterize baseline traffic conditions along the Road. The procedures outlined below are consistent with standard traffic analyses that ERM has conducted for other clients around the world.

Locations

ERM recommends that traffic be counted in three locations:

- Just north of Mora Kondre (and south of Moengo) along the Moengo-Langa Tabiki road;
- Just west of Abadu Kondre along the Paramaribo-Moengo road;
- In Tamanrejo at the major cross roads; and
- Just east of the bridge over the Suriname river (Bostebrook).

Timing and Duration

Counts should be taken on at least two separate days, including one midweek day (Tuesday through Thursday) and one weekend day (Saturday or Sunday). Counts must occur during good weather (e.g., no major rain storms), and may not occur on holidays.

Each count should last from 06:00 to 20:00. Traffic must be counted all locations on the same days simultaneously.

Procedures

The number and type of vehicles traveling in each direction should be recorded, separated into 30-minute intervals (see attached sheet and diagrams).
Vehicles should be counted by type, using the following classifications:
- Type I: Standard passenger automobiles (2 axles)

- Type II: Light trucks (primarily designed to carry cargo, with 2 axles)

- Type III: Heavy vehicles (any vehicle with 3 or more axles, and all buses).

A separate category ("Other") should be used to capture movements of pedestrians, bicycles, and motorcycles.

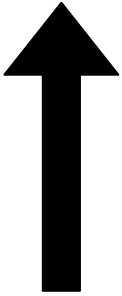The following pages provide exemplars of the survey forms to be completed.
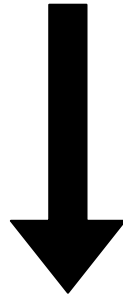
Mora Kondre Location

N

Moengo Direction

A

B

Langa Tabiki Direction

Langa Tabiki to Moengo Road

Time Period: <u>0600h – 0629h</u>				
Traffic Volumes	**Cars**	**Light Trucks**	**Heavy Trucks**	**Other (Pedestrian, bicycle, motorcycle)**
Direction A				
Direction B				

Paramaribo – Moengo Road

Abadu Kondre Location

N
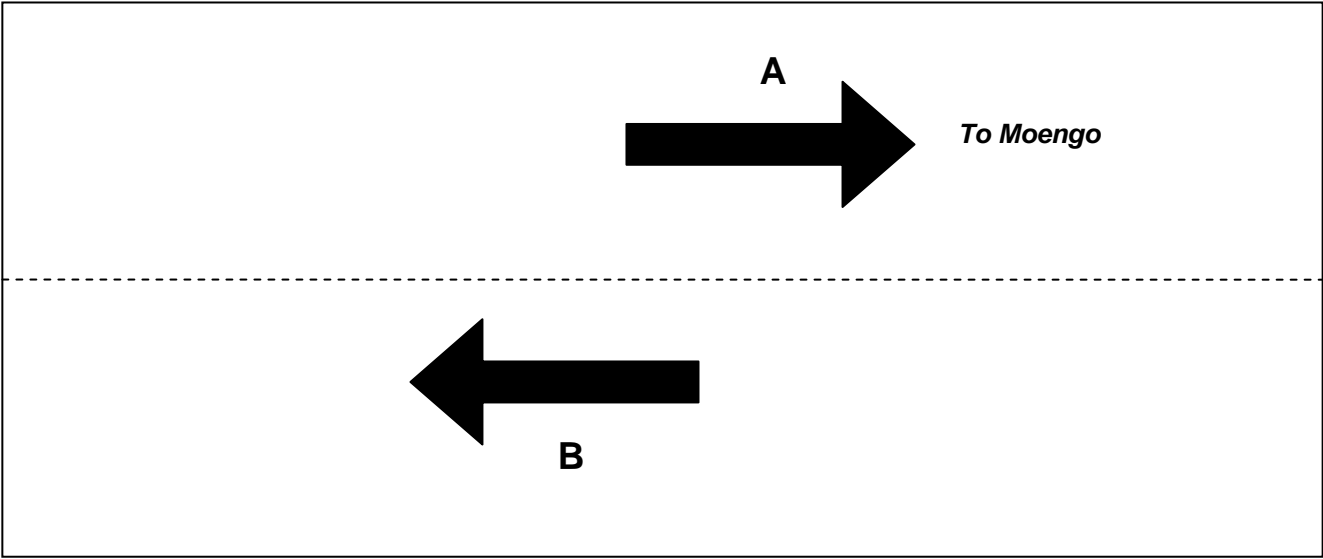
A

To Moengo

B

Time Period: 0600h – 0629h				
Traffic Volumes	**Cars**	**Light Trucks**	**Heavy Trucks**	**Other (Pedestrian, bicycle, motorcycle)**
Direction A				
Direction B				

Tamarejo Location

Alkmaar Road

N

A B C

I H G

Paramaribo Road

Moengo Rd

J K L

E F D
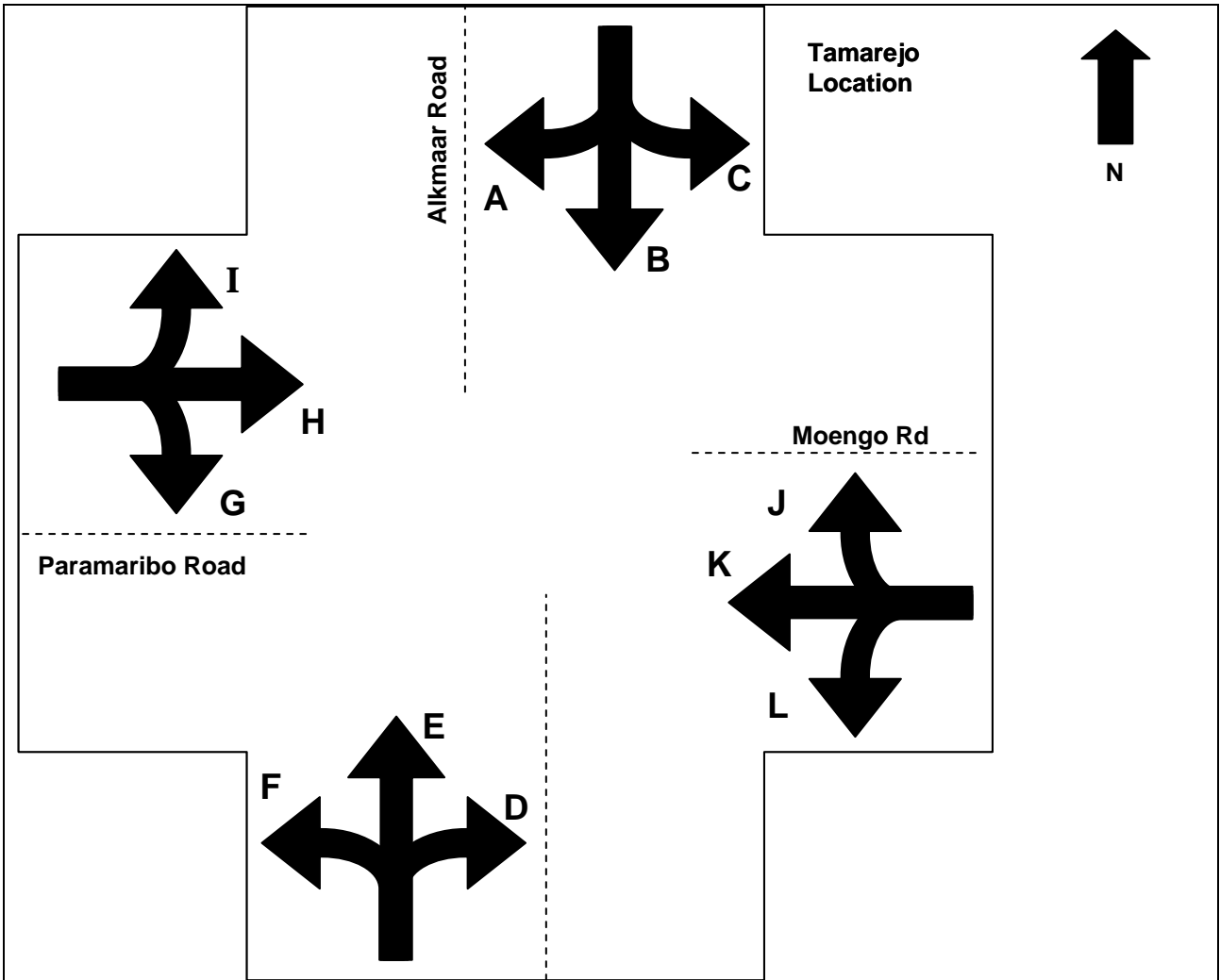
Traffic Counts—Time Period: 0600h – 0629h

Direction	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)	Direction	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
A					G				
B					H				
C					I				
D					J				
E					K				
F					L				

Paramaribo – Moengo Road

N ↑ Suriname Bridge Location

A → *To Tamarejo*

B ←
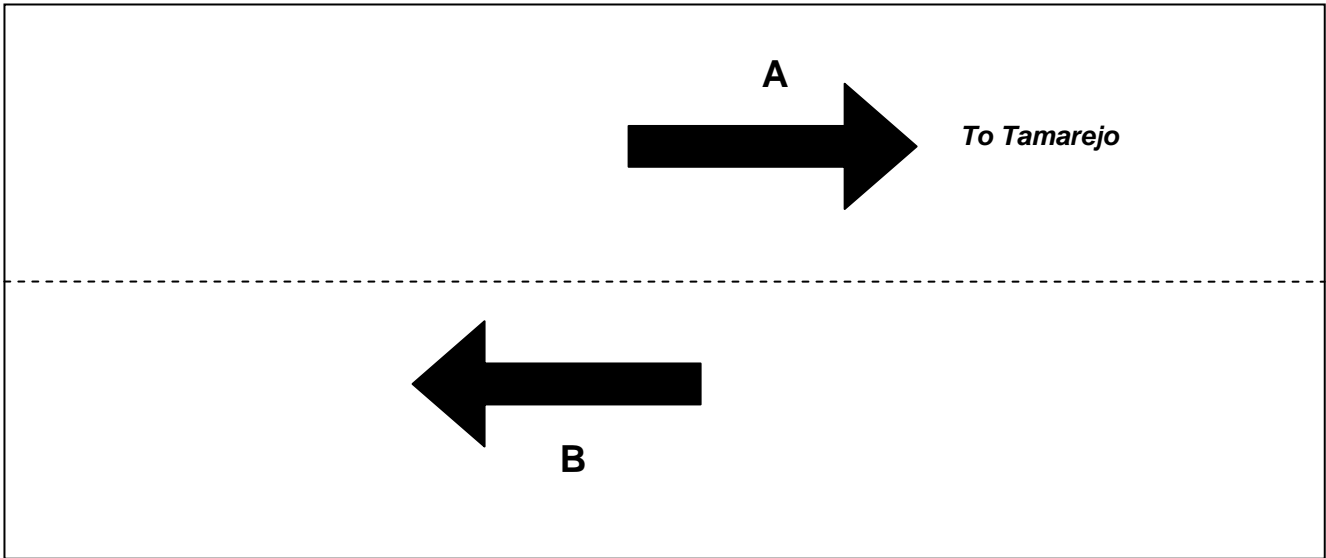
Time Period: 0700h – 0729h				
Traffic Volumes	**Cars**	**Light Trucks**	**Heavy Trucks**	**Other (Pedestrian, bicycle, motorcycle)**
Direction A				
Direction B				

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ERM's London Office

ERM
2nd floor
Exchequer Court
33 St. Mary Axe
London EC3A 8AA
T: +44 20 3206 5200
F: +44 20 3206 5440

www.erm.com