



# REVIEW OF SURGOLD MERIAN PROJECT DRAFT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

NIMOS  
Office of Environmental and Social Assessments  
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# Table of Contents

1	Introduction .....	2
2	Review approach .....	2
3	Report format .....	3
4	General Conclusions and Recommendations.....	3
5	Follow-up.....	4

Part A: NIMOS and expert comments on the Surgold Merian Gold Project Draft Environmental and Social Impact Assessment

Part B: Checklist for the Review of Environmental Assessments

# 1 Introduction

This report is the review of the Draft Environmental and Social Impact Assessment (Draft ESIA) of the Surgold Merian Gold Project. Surgold approached NIMOS in June 2008 with their intention to conduct an Environmental and Social Impact Study for Gold Mining in the Merian Project area. After Screening NIMOS considered this a Category A Project, which meant a full Environmental Impact Study was required. It was considered Category A because the project would affect more than 10,000 hectares of land.

Surgold contracted ERM (Environmental Resource Management) a consultancy firm mostly based in the USA, to conduct the Environmental and Social Impact Assessment. NIMOS had meetings with Surgold and ERM on 14 and 30 June 2011 for coordination purposes and to discuss the Terms of Reference, effectively starting the ESIA Scoping phase. A Draft Scoping report was submitted to NIMOS, and Public meetings were held by Surgold and ERM from 17 to 19 August 2011 to discuss the project with stakeholders at Langatabiki, Moengo and Paramaribo. After receiving comments from NIMOS, a final scoping report was submitted to NIMOS. NIMOS closed off the scoping phase in October 2011.

The review phase of the project started in June 2012. One hard copy and a soft copy of the Draft ESIA were submitted by Surgold for review at the NIMOS Office the 4<sup>th</sup> of June 2012. NIMOS guidelines required five hardcopies to be submitted. The remaining four hardcopies were submitted two weeks later.

# 2 Review approach

For the review of the Draft EIA NIMOS followed the following approach:

- An in-house review of the whole Draft EIA. The results of this review are included in **Part A** of this report;
- NIMOS contracted the Canadian firm **Hatfield Consultants** to conduct an expert review on the ESIA (Draft and Final). The NIMOS review coordinator, Hatfield Project Manager and Hatfield Hydrology Specialist conducted a site visit to the Project area from June 10 until June 13, 2012. The Surgold Public Meetings held in Langa Tabiki on June 11, 2012 and in Paramaribo on June 14, 2012 were also attended. The Hatfield team also had discussions with members of Surgold and their ESIA team from ERM on site;
- Working with the NIMOS comments and the specialist review report NIMOS summarized the review as per the NIMOS checklist, included in **Part B** of this report.

### **3 Report format**

As briefly addressed in the previous section this review report includes the following parts:

- Part A: NIMOS and expert comments on the Surgold Merian Gold Project Draft Environmental and Social Impact Assessment;
- Part B: Checklist for the Review of Environmental Assessments

### **4 General Conclusions and Recommendations**

After reviewing the Draft ESIA NIMOS can summarize the conclusion from the review as follows:

- Project Description: Overall a good project description, although presentations of some maps can be better and some of the facilities (among others Treated Water Storage Pound) are missing on the map.
- Cyanide Use, Management and Monitoring: the discussion in the draft ESIA is very generic and does not address cyanide management to the level that the reader is convinced that cyanide management practices and usage at the Surgold site are well understood and manageable;
- Baseline information: Most of the information is comprehensive and satisfactory. The deficiency is with the water resources part where there is limited baseline data available, and water resources has an important link to other environmental and social receptors.
- Impact Description: For the most part satisfactory, but in our view the Water Resources Impact description has a certain level of uncertainty due to the limited baseline data available;
- Mitigation Measures: The Mitigation measures mostly refer to the Management Plans;
- Management Plans: Management Plans are missing in the Draft ESIA.

The recommendations can be summarized as follows:

- update the Project Description with a better presentation of the maps and inclusion of missing information;
- given the limited baseline data on water resources available, Surgold should describe in the Revised ESIA how they will address this problem. The current Draft ESIA lacks detail on this;
- Surgold should prepare a Table of Commitments that summarizes all the commitments made in the Final ESIA report in a user-friendly format. This table should address both environmental and socio-community commitments;
- the impact description and mitigation measures should be revised where necessary;
- the Management Plans should be presented in the Revised ESIA;

## 5 Follow-up

Looking at the deficiencies in the Draft ESIA it is not advisable at this stage to submit a Final ESIA to NIMOS. At this stage a Revised ESIA should be submitted to NIMOS.

The Revised ESIA should be presented as follows:

- **One hard copy** and **one soft copy** of the Revised ESIA document, Volumes I, II and III. Volume III should contain all the missing appendices.
- **Five hard copies** of the Management Plans which were not included in the Draft ESIA.

After satisfactory review of the Revised ESIA, NIMOS will notify Surgold to submit two Hardcopies of the Final ESIA (including the Management Plans) for approval. The approval of the Final ESIA will be submitted by NIMOS to the permitting agency responsible for Rights of Exploitation (Ministry of Natural Resources) and Surgold will be notified when this submittal has occurred. The Final ESIA will be the working document to which we will refer in the Construction and Operations phase, although we recognize that the Management Plans are living documents which need to be revised from time to time.

**Part A: NIMOS and expert comments on the Surgold  
Merian Gold Project Draft Environmental and  
Social Impact Assessment**

## NIMOS Comments on the Surgold Draft Merian Gold Project ESIA

### General Comments

1	A lot of plans are not in place which made it difficult to review the ESIA because references are made to these plans.
2	What is meant by the Industrial Zone Boundary? This has not been described in the project description
3	In some of the maps (e.g fig 5-11) the country borders are not according to our official maps. Please adjust those maps.
4	Many maps are not integrated in the report (no page numbers), which makes it difficult to refer.
5	The numbering of the appendices is very strange. It does not start with appendix 1. And some appendices are not numbered so one does not know where a specific appendix starts.

### Specific Comments

<u>Page</u>	<u>Information presented in Draft ESIA</u>	<u>Review comments</u>
<i>Chapter 2 Legal and Institutional Framework</i>		
2.2	2.1 Suriname Laws and Regulations	<ul style="list-style-type: none"> <li>- <b>2<sup>nd</sup> paragraph:</b> please include the article of the Constitution which is cited here.</li> <li>- <b>4<sup>th</sup> paragraph:</b> please check the Dutch name of NIMOS; <i>Nationaal</i> instead of <i>Nationale</i>. Also check the current Focal Point for the Biodiversity Convention. ATM is no longer the Focal Point of this convention.</li> <li>- <b>5<sup>th</sup> paragraph:</b> please include the latest Multi-Annual Development Plan 2012 – 2016 and the latest Government Declaration “Kruispunt” 2010 -2015.</li> </ul>
		- Please include a table of relevant treaties ratified by Suriname, such as the Biodiversity Convention.

<b><u>Page</u></b>	<b><u>Information presented in Draft ESIA</u></b>	<b><u>Review comments</u></b>
<b><i>Chapter 3 Project Description</i></b>		
3-11	Figure 3-3	One of the sediment ponds is outside the proposed right of exploitation. Has this been covered with the relevant permitting government institutes?
3-13	Section 3.3.1 Mine Pits	Is there a detail engineering design of the mining available?
3-21	Section 3.3.5 Tailings Storage Facility Regardless of the deposition...A3 creek and North Fork of A3 Creek....Tempati Creek Tributary as Appendix 3-C	Please include creeks in figure for orientation purposes.
3-21	Section 3.3.5 (Text below figure 3-6 regarding modeling and analysis undertaken)	What is the status of the modeling and analysis? It is very important to include it in the Final ESIA in order for NIMOS to make a well informed decision.
3-24	Section 3.4.1 Power Plant	Where will the location of this power plant be? The specifications of the power plant are not clear. It is part of the project, so please provide clear information and don't just state that it will be designed such that emissions meet those recommended in the IFC EHS Guidelines for thermal power plants. Don't forget that if the power plant was stand alone it would require an ESIA. As it is part of the project the impacts and mitigation should clearly be described as part of the mine project.
3-25	Section 3.4.4 Fuel and Chemical Storage There will be two on-site fuel storage locations...as shown on Figure 3-2	The locations are not shown in Figure 3-2. It only shows the TSF locations.
3-28	Section 3.4.6 last paragraph, Hazardous material	What are the Surgold criteria to approve a facility for Hazardous waste disposal? Are there any facilities identified in or outside of Suriname?
3-33	Section 3.5.2 Pit Dewatering	In the text references are made to Figure 3-7. Where in Figure 3-7 are the following locations: sump, sedimentation basin, waste water treatment facility and the Treated Water Storage Pond?

<b><u>Page</u></b>	<b><u>Information presented in Draft ESIA</u></b>	<b><u>Review comments</u></b>
		What are the numbers 1, 3 and 4 in Figure 3-7? Is sedimentation basin the same as sedimentation pond?
3-37	Section 3.5.7 Fresh water supply The location and other design details of the groundwater wells and rainwater collection system have not been developed at this time.	When will this be done?
3-37	Section 3.5.8 Sewage waste water treatment plant	Where will this location be?
<b><i>Chapter 4 Project Alternatives</i></b>		
4-5	An alternative risk analysis was conducted that compared six different options	Only four options are discussed and some of these differ from the description in table 4-2
4-7	Table 4-2	There are some errors and omissions in the table. e.g, where you have alternative (1 <sup>st</sup> row, 3 <sup>rd</sup> column) it should be rating
4-14	Table 4-4	It is unclear how the score rating was established and what it means.
4-16	Table 4-6	It is unclear how the score rating was established and what it means.
<b><i>Chapter 5 Project Location and Setting</i></b>		
5-8/5-10	Section 5.2.4 to 5.2.6	References made to certain figures are not correct.
<b><i>Chapter 6 Air Quality and Greenhouse Gas Baseline</i></b>		
6-8/6-10	Table 6-1 through 6-3	What is the reason that the sampling equipment at all three sites failed between the dates of 11/14/2011 and 11/23/2011 ?
<b><i>Chapter 8 Landscape and Soils Baseline</i></b>		
8-1	Figure 8-1	A colored map would be much easier to interpret.
8-2	Last paragraph: “ Since the topsoil resources in the study area.....not considered to be critical”.	Maybe the topsoil resources are not significant, but this could be a normal feature of tropical rainforest. If not preserved, please explain what material will be used for rehabilitation purposes.
<b><i>Chapter 9 Water resources baseline</i></b>		
9-5	Section 9 Water use in the Project Area is	What kind of water is now used at the Surgold site?

<b><u>Page</u></b>	<b><u>Information presented in Draft ESIA</u></b>	<b><u>Review comments</u></b>
	limited....entire region.	
9-35	Section 9.2.2 Study area streamflow – Marowijne watershed Table 9-9 Summary of predicted Streamflows in Las Dominicanas Watershed	Shouldn't it be "Summary of predicted streamflows in Merian Creek Watershed"?
9-65	Figure 9-28	The TSF is divided in 3 parts. In other maps the TSF is divided in 2 parts. This is very confusing. Which one is correct?
9-77	Figure 9-33	Why is there such a big difference between borehole elevations and the elevation contours?
<b><i>Chapter 10 Traffic Baseline</i></b>		
10-7/10-8	Section 10.1 Traffic Characteristics Figures 10-3 and 10-4	Comparing these figures with table 10-1, is the color coding correct? According to table 10-1 traffic volumes are higher at the Bosje Brug location compared to Tamanredjo location. The same for Abadu Kondre and Mora Kondre.
<b><i>Chapter 11 Biological Resources Baseline</i></b>		
11-3	Figure 11-3/11-4	Could you please, reorganize the maps, especially the one on aquatic fauna? It would be better to have these maps in chapter 12.
<b><i>Chapter 14 Social Baseline</i></b>		
14-4	Maroon in Suriname Maroons in Suriname are descendants of rebel African slaves	Please consider if runaways (instead of rebel) African slaves would be a better description.
14-36	Education Infrastructure Primary school leaving age is officially 13;	Is this not at age 15 (Leerplicht)?
	14.3.4 Education in Paramaka Area	Where is the Surgold story? That is also part of the baseline. In all Surgold presentations mention is made of the study finance for the best students in this area, those who finished the exam of K-6.

<b><u>Page</u></b>	<b><u>Information presented in Draft ESIA</u></b>	<b><u>Review comments</u></b>
<b><i>Chapter 16 Air quality and greenhouse gas impacts</i></b>		
16-8	Table 16-2	There are five power plants mentioned. Will there be five plants for the project or were these options considered out of which one will be selected?
<b><i>Chapter 19 Water Resources Impacts</i></b>		
19-47	1 <sup>st</sup> paragraph: “As shown in error! Reference source”	Clearly a mistake in text. Please correct.
<b><i>Chapter 21 Biological Resources Impacts</i></b>		
21-15	21.1.4 Injury and Mortality of Wildlife Targeted pre-disturbance surveys and relocation of herpetiles prior to disturbance will reduce mortality associated with land clearing and excavation	How will these surveys and the relocation be conducted? What are the factors for success regarding the relocation?
21-26	21.5.1 Increases in turbidity and sedimentation Mitigation To mitigate impacts on these areas, the proposed Project would implement an Erosion and Sediment Control plan ... Aquatic biological monitoring will be conducted to assess the effectiveness of mitigation measures in addressing Project related impacts on aquatic biota.	Erosion and Sediment Control plan; are mentioned so many times, but they are not in the report, not even a framework to have an idea of what they might be.
<b><i>Chapter 22 Land Use Impacts</i></b>		
22-2	22.2.2 Reduction of land available for hunting and NTFP gathering. Mitigation See Section 22.2.1.2. 14-58/59 Natural Resources	The report is referring to these sections. Could you please change the structure of the report so that it is easier to read? NTFP gathering is very important for the social and economic well being

<b><u>Page</u></b>	<b><u>Information presented in Draft</u></b> <b><u>ESIA</u></b>	<b><u>Review comments</u></b>
	NTFP gathering	
<b><i>Chapter 25 Summary and Conclusions</i></b>		
25-3	Table 25 -1 Physical Impacts Summary Impact Rating After Mitigation or After Implementation of EMMP e.g Insignificant (Severity – Low; Likelihood – Low)	How has the rating been established? There is no EMMP
<b><i>Appendix 3-C Deposition Sequence Options Tailings Storage Facility – Technical Memorandum</i></b>		
	Figure 1	Will the camp site area ultimately be in the tailings pond phase 2? If so how should we picture this? Will it not be a hazard for the camp employees?
<b><i>Appendix 16-B Evaluation of ambient air quality impacts for a mining project in Suriname</i></b>		
12	Table 3	Suriname does not know these seasons. We have the rainy seasons (Short and Long) and the dry seasons (Short and Long)

# TABLE OF CONTENTS

<b>LIST OF APPENDICES .....</b>	<b>ii</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
<b>2.0 DISCUSSION OF ENVIRONMENTAL ISSUES: ADAPTIVE WATER MANAGEMENT .....</b>	<b>4</b>
<b>2.1 INTRODUCTION .....</b>	<b>4</b>
<b>2.2 BASELINE CLIMATE AND HYDROLOGIC DATA .....</b>	<b>4</b>
<b>2.3 SITE WATER MANAGEMENT .....</b>	<b>8</b>
<b>2.4 GROUNDWATER .....</b>	<b>11</b>
<b>3.0 DISCUSSION OF OTHER ENVIRONMENTAL ISSUES .....</b>	<b>13</b>
<b>3.1 GENERAL .....</b>	<b>13</b>
<b>3.2 OBSERVATIONS AND REVIEW COMMENTS.....</b>	<b>13</b>
3.2.1 Water and Wastewater Management .....	14
3.2.2 Cyanide Use and Cyanide Management and Monitoring.....	15
3.2.3 PAG, Potentially Acid Generating Ore and Waste Rock.....	15
3.2.4 Environmental Management Plans.....	16
3.2.5 Table of Commitments .....	16
<b>4.0 CONCLUDING REMARKS .....</b>	<b>18</b>

## **LIST OF APPENDICES**

Appendix A1 Comments Table

Appendix A2 Overview of the Draft ESIA Air Quality, Noise and Social and Health Studies

## 1.0 INTRODUCTION

The National Institute for Environment and Development in Suriname (NIMOS) retained the Hatfield Consultants (Hatfield) Team to assist with an environmental review of the Suriname Gold Company (Surgold) proposed Merian mine project. This review addresses the Merian Project Draft Environmental and Social Impact Assessment (ESIA) submitted by Environmental Resources Management (ERM) on behalf of Surgold on June 4, 2012.

The Hatfield Team is comprised of environmental professionals with expertise in the fields of ESIA, hydrology, chemistry, biological resources, socio-community, noise and air quality. All have worked on mining industry projects and other large infrastructure development projects. To some extent, other experts were drawn into the review but on a limited scale basis, i.e., mostly to comment or provide advice on a specific item outside the expertise of the review team. This evaluation (review) benefitted from two team members:

- visiting the project site between June 10-13;
- attending the Surgold sponsored Public Meetings held in Langa Tabiki on June 11 and in Paramaribo on June 14;
- meeting with Surgold Merian project team staff in Suriname during the week of June 9 and with Golder Associates staff in Redmond, Washington on June 28.

NIMOS was consulted during this review and report preparation but primarily with respect to procedural and scheduling matters. The comments herein are the views of the Hatfield Team. The authors approached their task recognizing that ESIA is an important project planning and environmental management tool and key to a successful environmental management program for a proposed large-scale development.

Hatfield recognizes that the schedule established for the submission of the Draft ESIA was very tight and that schedule drove the Draft ESIA submission process. Although the schedule was (essentially) adhered to, the tight timelines have led to the requirement for Draft ESIA report corrections and revisions that will need to be included in the Revised ESIA. It is understood that this matter is being addressed by the ERM Team for Surgold. The purpose of this Hatfield report is to focus on environmental issues and environmental management. It is not our intent to list or comment on all needed corrections and revisions. However, we do wish to note the following:

- in Appendix I we have provided comments that, to some extent, address areas of the report where corrections and revisions would contribute to an improved Revised ESIA; and

- some figures in the Draft ESIA were difficult to work with and we recommend that those involved in producing the Revised ESIA, review and edit report document figures as part of the report revision process.

The Draft ESIA report would have benefitted from a thorough review by members of the Surgold team before submission. The result of submitting before a completeness review was undertaken has resulted in some information being submitted separate from the Draft ESIA document. Shortly after the submission of the Draft ESIA, the following documents were submitted in support of the Draft ESIA:

- List of Acronyms;
- Environmental Design Criteria (replaces Volume III, Appendix 3-B of original submission);
- Biodiversity and Critical Habitat (added to Volume I, Section 11.0, “Biological Resources Baseline” of the Draft ESIA); and
- Merian ESIA Environmental Management Plan Template (added to Volume II, Section 25.2, “Proposed Environmental and Social Management and Monitoring Plan”).

We have considered the additional documents listed above as part of the Draft ESIA for the purposes of this review. In particular, the Environmental Design Criteria (bullet 2 above) was a significant addition to the Draft ESIA submission. Additional information was received later in the Draft ESIA review phase. By agreement, this information was not included in the review since the information was not available to the public and other parties also involved in the review of the Draft ESIA Report. It is assumed that Merian Project information that was not included in the Draft ESIA review will be integrated into the Revised ESIA and will therefore be considered at the time the Revised ESIA is reviewed.

It is recognized that artisanal mining activities have impacted lands within and surrounding the Surgold industrial zone and, in fact, these activities continue to impact areas in the immediate vicinity of the Surgold industrial zone. It is noted that environmental management practices are not being implemented at the artisanal mining sites. Over the long term, site remediation proposed by Surgold will, in fact, address impacts created by the artisanal miners within the project’s industrial zone. As expected, Surgold is being held to a higher level of responsibility with respect to environmental management than the artisanal miners.

In the text herein, we refer to the re-submitted (next version) of the ESIA as the Revised ESIA instead of the Final ESIA. Comments are provided herein with respect to some significant additions and improvements that we feel are needed to the Draft ESIA. It is certainly possible that the next ESIA submission will meet the requirements of a Final ESIA and it is reasonable to expect that this would be

Surgold's goal. The acceptance of the Revised ESIA as the Final ESIA is a NIMOS and Government of Suriname decision. Hatfield will provide advice on this matter as requested.

The Revised ESIA will be submitted after the Surgold team addresses comments provided in this document and addresses other matters raised by the public and others during the Draft ESIA review phase. Simultaneously, the Merian project team is also completing on-going technical studies and undertaking other improvements to the ESIA document. The overall process itself is somewhat unwieldy but considering that the goal of the process, from Surgold's perspective, is to have an ESIA document produced that is accepted by NIMOS, each of these steps and actions contributes to meeting this goal.

In the text that follows in this report, the following subjects are addressed:

**Section 2:** Discussion of Environmental Issues: Adaptive Water Management

**Section 3:** Discussion of Other Environmental Issues

**Section 4:** Concluding Remarks

Appendix 1 contains comments that are specific to information presented in the Draft ESIA. Appendix 2 contains summaries of the review comments provided by the air quality, noise and socio-community specialists on the Hatfield Team.

## **2.0 DISCUSSION OF ENVIRONMENTAL ISSUES: ADAPTIVE WATER MANAGEMENT**

### **2.1 INTRODUCTION**

The text that follows in this section focuses on, in particular, the review of Sections 9.0 and 19.0 of the Draft ESIA Report and associated appendices while noting that Surgold has proposed an Adaptive Water Management approach for the Merian Project. The intent of this section is to provide NIMOS with an understanding of the weaknesses that currently exist in the baseline data and hence the challenges that exist in moving forward with an Adaptive Water Management approach. In our opinion, water management is the most significant challenge for the Merian site and warrants the consideration shown in the text that follows in this section. In Section 3.0, other environmental management matters are discussed in relation to information provided in the Draft ESIA.

### **2.2 BASELINE CLIMATE AND HYDROLOGIC DATA**

Ideally, several years of baseline climate and hydrologic data would be available for use in the design and environmental assessment of major projects such as the proposed Merian project. Adequate regional data would also be available to allow the site baseline data to be placed in a longer term context. At the present time, limited baseline climate and hydrologic data are available from the Merian project site and while regional daily rainfall data are available from within Suriname, there are no useful regional data for other important parameters such as short-interval rainfall intensities, and available regional streamflow data are of only very limited value. The shortage of climate and hydrologic data, both baseline and regional, presents challenges for project design, environmental assessment, and future environmental monitoring and compliance activities.

#### ***Rainfall Data***

Rainfall data have been collected at the mine site since December 2005, reportedly at a 5-minute time step. Monthly mine site rainfall amounts for the period December 2005 through December 2011 are summarized in the Draft ESIA. Review of hourly rainfall data provided separately by Surgold's consultants shows approximately 320 days of data missing in that period. Data reported for an additional five months appear to be unreasonably low and either have been or, in our opinion, should be excluded from analysis. The total amount of missing or apparently unreliable data amounts to a little over 20% of the period of record. There is no single calendar year with complete data, however complete data are available for the 12-month period from October 2008 through September 2009.

Despite the missing site data, the availability of long-term daily rainfall data from Alliance, roughly 100 km NNW of the mine site, together with a shorter record of daily rainfall from Langa Tabiki, in relatively close proximity to the mine site,

should allow for reasonably reliable estimates of average annual and monthly rainfall amounts at the site. More problematic are estimates of extreme rainfall amounts and short-duration rainfall intensities required for the analysis and design of important water management facilities (e.g., the Tailings Storage Facilities and the sedimentation ponds).

Given the length and quality of the baseline rainfall record, the site data are only of value for approximately characterizing storm rainfall amounts and rainfall intensities for commonly occurring storms (of the order of a 2-year event). Regardless of missing data, the baseline rainfall data set is too short to allow reliable estimation of design parameters for extreme events, such as 25-year or 100-year rainfall depth-duration data. Long-term records of daily rainfall from Alliance were used in conjunction with daily data from Langa Tabiki to guide estimation of site rainfall depth-duration data for durations of 24 hours and greater, however no regional short duration (i.e. less than 24 hour) rainfall data were identified within Suriname on which to base estimates of short duration extreme rainfall amounts.

With the lack of suitable long-term short duration rainfall data from within Suriname, Surgold has used judgment guided by the short record of available site data and rainfall depth-duration data transposed from Miami, Florida to develop estimates of short duration extreme rainfall amounts at the Merian site. Considering the distance involved in transposing data from Miami, these estimates are obviously uncertain. Efforts should be made to improve confidence in the estimates of extreme rainfall amounts by improving the reliability of site rainfall data collection and making additional efforts to identify and acquire more representative regional data.

### ***Streamflow Data***

At the time the Draft ESIA was submitted (June 2012), minimal baseline streamflow data had been collected and the available data was generally of uncertain quality. The approach to streamflow data collection adopted at the project site is the standard approach for small free flowing streams and rivers used worldwide. Water levels are monitored at regular intervals at a fixed location (at the Merian project, water levels are monitored on a continuous basis at either a 15-minute or 30-minute interval depending on location). Stream discharge is measured periodically along with the concurrent water level to establish a one-to-one relationship between water level and discharge. That relationship (the stage-discharge rating) is then used to convert the continuous record of 15-minute or 30-minute water level to a corresponding record of streamflow data. To develop baseline streamflow data then requires:

- a reliable record of water level data; and
- establishment of a reliable stage-discharge rating to convert water level data to discharge.

Water level monitoring and stream gauging activities at the site were only initiated in August 2011. At the release of the draft ESIA, there were four active water level monitoring gauges at the site with a period of record of from four to six months through about March 2012, essentially encompassing a single dry season. Water level data had been collected at two additional sites for a period of from one to two months but those sites had to be abandoned due to artisanal mining activities.

At the time of writing, preliminary stage-discharge rating curves had been established for three of the four currently active water level monitoring sites. Direct discharge measurements for two of the three sites covered low flows only, meaning that the stage-discharge ratings for those sites could only be reasonably defined over a relatively narrow range of low flows, and were only suitable for estimating base flows from the water level record. At the third site, a more comprehensive program of direct discharge measurements had been undertaken so that the stage-discharge rating is defined over a wider range of flows and can be used to estimate low and moderate flows. No wet season water levels had been obtained and no high flow discharge measurement had been made at any location at the time the draft ESIA was prepared.

It is evident that the baseline water level and streamflow monitoring program has faced, and will likely continue to face, challenges beyond Surgold's control associated with artisanal mining activities. Problems cited in the Draft ESIA, discussed with representatives of Surgold or its consultants, or identified in a site visit in early June 2012 include:

- Stream gauging activities were abandoned and water level monitoring equipment removed at two sites due to disruption of the stream channel by artisanal mining activities.
- Plans for stream gauging on Las Dominicanas Creek at site SW-27 were abandoned, again due to artisanal mining activities. Abandonment of stream gauging at this location means that there are no baseline streamflow data for use in assessing project water quantity impacts at the western boundary of the environmental study area.
- Heavy sediment loads, presumably due to artisanal mining, are reported to have adversely affected the reliability of water level data at some locations due to silting in of the monitoring equipment (water levels at Merian are monitored using submersible pressure transducers).
- It is likely that sediment deposition occurring at some gauge sites will result in shifts in the stage-discharge rating curves. If there is active sediment deposition at the gauge sites, a greatly increased frequency of direct or manual discharge measurements will be needed to provide a basis for adjusting the stage-discharge ratings over time.

In addition to the above, the size of the site and access difficulties at some locations has reportedly limited the frequency of manual discharge measurements and presumably may affect the frequency of data downloads. The difficulty of measuring high flows is likely compounded by the flashy nature of flood flows and large spatial variations in rainfall.

At the present time, the baseline streamflow data record has to be regarded as inadequate. Although the Draft ESIA (Chapter 9, page 9-29) acknowledges “difficulty establishing high-flow rating curve data”, the document also states (Chapter 9, page 9-29) that “low flows have been generally well measured and are reported with confidence”. We find this statement somewhat misleading given the small number of discharge measurements at two of the three sites and the relatively poor fit of the stage-discharge rating to the measured data at those sites. Furthermore, low flow data are only available for the 2011 dry season and data are not available to place the 2011 dry season in a longer term context.

Ideally, regional streamflow data would be available to assist in interpretation of baseline streamflow data. Regional streamflow data were obtained by Surgold from a total of nine stream gages, six in Suriname and three in French Guyana, commanding drainage areas ranging in size from 3,520 to 63,700 km<sup>2</sup>. By way of comparison, the project’s currently active water level monitoring sites have drainage areas from 2.8 to 87.8 km<sup>2</sup>. Eight of the nine regional stream gauges have only three to seven years of data collected during the period 1973 to 1983. The ninth site on Marowijne River in French Guyana, with a drainage area of over 60,000 km<sup>2</sup>, has approximately 45 years of data, ending in 1996. According to discussions with NIMOS, there are presently no active long-term stream gauges in the country, and there are apparently no regional data from small streams with similar characteristics to the streams directly affected by the Merian project. While Surgold has used the regional data to the extent possible to estimate baseflow yield (i.e. base flow per unit drainage area), given the differences in drainage area between the regional and project gauge sites, the regional data can realistically only be used to provide an order of magnitude estimate of baseflow conditions at Merian. Because of the large differences in drainage area and differences in other watershed characteristics, the regional data cannot be used to estimate wet season flows or flood flows on the project site.

### ***Summary and Recommendations***

As a result of the short period of baseline monitoring at the site, and the lack of regional meteorological and hydrologic data within Suriname, characterization of baseline climate and hydrologic conditions is considered to have a high degree of uncertainty, particularly in terms of estimates of extreme storm rainfall amounts, short-interval rainfall intensities, and streamflow flood peaks and volumes. Uncertainty in site climate and hydrologic conditions has a direct linkage to uncertainty in:

- the design and performance of proposed site water management facilities;
- the projected environmental impacts of the project; and
- the success of environmental mitigation measures intended to assure compliance with project environmental objectives and criteria.

We recommend that Surgold develop a detailed monitoring plan and improved field procedures for continuing collection of meteorological and hydrologic data with the objectives of improving the amount and quality of baseline data available for environmental assessment and project design over the next two years. Particular attention should be placed on improved monitoring of streamflow and steps should be taken to address the streamflow data gap at the western boundary of the environmental study area.

We acknowledge the difficulty Surgold has had in identifying regional short-interval rainfall data as illustrated by the fact that Surgold has had to transpose short-interval data to Suriname from the southeast USA. We would expect some short-interval rainfall data to be available within Suriname and suggest that Surgold pursue the identification and acquisition of such data, with assistance from their local consultants and contacts they have developed with the staff of government agencies.

Surgold’s consultants should be commended for their forthright portrayal of the available data and for the data QA/QC procedures implemented to date.

## **2.3 SITE WATER MANAGEMENT**

Two of the key objectives of the ESIA process for the Merian project are:

- assessing the environmental impacts that would result from the project’s development, operation, and closure; and,
- identifying appropriate mitigation measures required to address impacts at all stages of the project life.

The amount of detail required to quantify impacts and assure appropriate mitigation is often a source of debate and different parties will hold different views about the necessary level of detail and the point in the ESIA process where certain information is developed and presented. In our opinion, the current Draft ESIA falls short of adequately characterizing certain impacts and we find the level of detail pertaining to certain mitigation proposals inadequate to assure that the proposed conceptual measures will both achieve necessary mitigation and are feasible given physical constraints at the Merian site. A part of this difficulty may lie in the organization of the report or the level of reporting provided.

Water management at the site clearly plays a significant role in project operations, potential impacts to the environment, and the mitigation of those impacts. Water management activities identified in the Draft ESIA include amongst others:

- site drainage;
- sediment control;
- pit dewatering;
- management of waste rock dump runoff;
- tailings water management;
- process water management; and
- water treatment.

While the ESIA presents a relatively clear high level conceptual picture of mine water management and related infrastructure, the discussion of potential water resource impacts seems to be somewhat selective and must be regarded as preliminary. For example, in the area of water quality, work to characterize seepage quality from the TSF is not complete and we understand that treatment options and requirements for water collected in the TSF are still being examined. In several places (e.g. page 19-33), the ESIA acknowledges the preliminary nature of water quality analysis, which affects the planning and design of mitigation and contingency measures.

In another example, discussed in more detail below, water quantity impacts are determined using a rainfall-runoff model which cannot yet be calibrated or validated due to lack of baseline streamflow data. Water quantity impact assessments must be regarded as very preliminary and subject to change as baseline data become available.

Reporting of water resource impacts is mostly directed at projected impacts at the environmental study area boundary. Water quantity impacts discussed in the main body of the ESIA, for example, are restricted to changes in monthly average streamflows at the environmental study area boundaries for wet, dry and normal years. There is no discussion of potential changes in peak flows or storm runoff volumes and in fact the Draft ESIA is not clear regarding what level of peak flow control will be provided. Further, there is no discussion in the main body of the document of impacts internal to the environmental study area, although results from the water balance model (Appendix 3-D) show up to a 25-fold increase in monthly flows on Tempati Creek during the last year of project operations. Given the magnitude of those changes, reporting should be considered for impacts at selected points within the study area in addition to those at the study area boundary.

The TSF is a major facility and is probably the single most significant component of the site water management system. It also presents perhaps the greatest risk in terms of the potential for release of contaminated effluent to the environment. The TSF at its full size has a large surface area and potential for significant water storage which we expect would allow for a good degree of operational flexibility. Nevertheless additional reporting should be provided to demonstrate the performance of the TSF and the relationship of its performance to the sizing and capacity of other facilities, such as pumping capacity. Reporting of water balance results should be expanded to explicitly include reporting of discharges from the TSF to the treated water storage pond and to the environment.

It is generally not clear from the information provided in the Draft ESIA to what extent proposed water management infrastructure and mitigation measures are purely conceptual and to what extent analyses have been conducted to demonstrate their ability to meet project environmental design and discharge criteria and their feasibility given physical site constraints.

For example, reference is made to sediment control ponds in several places in the Draft ESIA but no information is provided on facility sizing necessary to meet project design criteria and no information is presented in the Draft ESIA to demonstrate that the facilities of the required size can be accommodated on site. Similarly, mention is made of lagoons for water quality treatment (nitrate removal) but again no sizing information is provided and it is not known to what extent Surgold has confirmed that such facilities can be accommodated on site. While we recognize that many details of mine facility design cannot be expected to be available at the present phase of project development, we expect that the Revised ESIA will present sufficient information to show that facilities proposed, including contingency facilities, are in fact feasible.

Another question that should be considered further in addressing water management follows. It appears that runoff will be allowed to enter the tailings storage facilities and the sedimentation ponds from nearby hillsides, increasing flows through these facilities and decreasing retention time. The feasibility, in both the short term and the long term, of diverting clean runoff flows around these wastewater treatment facilities should be considered and discussed in the Revised ESIA report.

A further difficulty in reviewing water management proposals and impact analyses, and developing confidence in proposed mitigation measures, is in evaluating the effects on analyses and design of the uncertainty in site climate and hydrologic data discussed earlier. Analysis of the water balance at the site has been conducted using the GoldSim rainfall-runoff model. At the time the Draft ESIA was prepared, site streamflow data were only available for a single dry season; **no** wet season data were available. In the absence of adequate site streamflow data, we understand that GoldSim model parameters were either selected using very limited regional runoff data (available from large rivers only) or using professional judgment. There is clearly considerable scope for

uncertainty in water management design inputs and it is not known how those uncertainties affect either the assessment of environmental impacts or the development of mitigation measures. In the case of GoldSim application, the Draft ESIA indicates that GoldSim modeling will be updated or refined as site data become available; the assumption inherent in the ESIA is that site facility designs and mitigation measures can and will be adjusted accordingly.

Given the various uncertainties and the various changes that will almost certainly occur over the life of the project, adaptive water management has been proposed as an important component of the project development. Given the limited baseline data available, we support adaptive management principles as a means of advancing the project, but are concerned about the lack of detail provided in the Draft ESIA. We would not expect to see a detailed adaptive water management plan in the Final ESIA, however given its importance, we would expect to see a discussion of objectives and a description of the framework within which such a plan would be developed and implemented at the Merian site.

In summary, we suggest for the purposes of the Revised ESIA, that:

- reporting of water resource impacts be expanded to include additional detail and additional reporting points within the study area;
- further detail be provided of proposed mitigation and contingency facilities to provide assurance that proposed facilities can meet project design criteria and can be feasibly accommodated on the site;
- further detail be provided of the performance of the tailings storage facility to specifically include information on direct and indirect releases to the environment; and
- further details of the proposed adaptive water management plan be provided.

Recognizing the uncertainty inherent in projecting water management requirements through the life of the project, we recommend that, in providing the additional detail requested above, greater focus should be placed on the facilities and infrastructure required through perhaps the second or third year of project operations.

## **2.4 GROUNDWATER**

Groundwater information presented in Sections 9.0 and Section 19.0 of the Draft ESIA Report and related appendices was also reviewed. Subjects addressed in the Draft ESIA include geology, geochemistry, groundwater hydraulic conductivity, water flow patterns, impacts to surface water flow regime, etc. The information provided is based on field studies (e.g., the installation piezometers, test wells and monitoring wells and water quality analysis of samples collected)

as well as modeling studies and other analysis. Data collection is on-going. In general, the level of detail is appropriate for an ESIA report. Surgold is proposing to use an adaptive water management approach with respect to addressing groundwater issues at the mine site.

Surgold should identify in the Revised ESIA their proposed on-going commitments with respect to groundwater monitoring and data analysis. Seepage will continue from waste rock storage piles and the tailings storage facilities during mining operations and when mining activities cease. Potential strategies for monitoring and managing seepage beyond the end of mining activities need to be discussed in more detail. For example, Volume III, Appendix 19A discusses tailings storage facility seepage capture using drains and/or collection wells but this matter is not discussed in Volume II, Section 19 where impact assessment and mitigation are discussed.

## **3.0 DISCUSSION OF OTHER ENVIRONMENTAL ISSUES**

### **3.1 GENERAL**

The intent of this section of the report is to focus on the components of the Draft ESIA that need to be expanded upon and/or upgraded in revising the Draft ESIA document for re-submission. The Hatfield team did not focus on matters that are typically addressed effectively in mining industry projects through the application of standard approaches and best management practices (e.g. sewage disposal, refuse disposal, etc.).

Some areas of the Draft ESIA report require very little updating in moving from the Draft ESIA to the Revised ESIA. Sections of the Draft ESIA Report addressing the following topics fit into this broad category:

- Air quality;
- Noise; and
- Socio-community, socio-economic and public health.

It is acknowledged that baseline data is an important component of an ESIA study. In our review of the Draft ESIA, we have attempted to be reasonable with respect to baseline data needs. We know from our experience on many other projects that it is easy to argue that the baseline data available and included in an ESIA report are inadequate in some manner. With the exception of the data needed for water management as discussed in Section 2.0 of this report, we have not identified any critical baseline data deficiencies. However, we note that it is important that Surgold identify in the Revised ESIA the environmental studies that are planned or are currently on-going and will continue during the time period between when the Revised ESIA is submitted and the time that the mine goes into production. Data gathered will help to establish a solid baseline for planning and design of environmental management features and strategies and for comparative and compliance purposes in the future. This information will be important regarding the implementation of adaptive environmental management strategies during the life of the Merian Project.

### **3.2 OBSERVATIONS AND REVIEW COMMENTS**

Based on a review of the Draft ESIA Report and on information gathered during the field trip, the Hatfield Team identified several matters as significant potential environmental concerns that needed to be discussed in this report. They are:

- Water and wastewater management (recognizing weaknesses in baseline rainfall and hydrological data);
- Use of cyanide;
- PAG, i.e., potentially acid generating ore and waste rock;

- Environmental management practices; and
- Tracking environmental commitments.

Each of these subjects is discussed in the text that follows.

### **3.2.1 Water and Wastewater Management**

The Merian project is a large mining project with a challenging water and wastewater management component directly associated with it. As discussed in Section 2.0, the climate and surface water hydrology data for the area are not at the advanced level generally encountered at this stage of a proposed mining development. Surgold has suggested that an adaptive water management approach be adopted for this project. Surgold, in the Revised ESIA, should address the question of “how the Merian project will address data deficiencies in the time between now and the time the mine is expected to go in to production in late 2014” (i.e., assuming development of the mine begins in the second half of 2012 following submission of the Revised ESIA). There is a need to better understand what new information will be gathered during the next two and half years and how it will be used for the purposes of planning mine infrastructure and environmental management facilities.

Noting that new technical information will be available for inclusion in the Revised ESIA Report, we expect that the Revised ESIA will be a significant improvement to the Draft ESIA in many technical areas. The exception to this will likely be in the area of new baseline data available for water management planning purposes as not much new information is likely to become available in the short period (likely 2 months or thereabouts) during which the ESIA is being revised. As stated in Section 2.4, a Water Management Plan is needed to cover at least the early operational phases of the project and should be included in the Revised ESIA.

In Section 2.0 of this report we have provided a discussion of baseline climate and hydrological data and water management that illustrates the data deficiencies that currently exist. If the project is to proceed to development in the near future, it is apparent that water and wastewater management will have to be based on an Adaptive Water Management approach. A Water Management Plan (including figures illustrating the mine site layout and preliminary design drawings) applicable to the situation at the end of Year 2 of mining operations would be a useful addition to the Revised ESIA. By focusing on Year 2 of the mining operation and convincing the ESIA report reviewers that water and wastewater management are well understood and manageable at that point in time, it will be easier for reviewers to accept the overall long term implications of Adaptive Water Management.

### **3.2.2 Cyanide Use and Cyanide Management and Monitoring**

It is well understood that cyanide is highly toxic to fish and aquatic resources and is a human health concern. On the other hand, we acknowledge that cyanide is used world-wide in gold mining operations.

The discussion in the Draft ESIA is very generic and does not address cyanide management to the level that the reader is convinced that cyanide management practices and usage at the Surgold site are well understood and manageable. We recommend that cyanide use and cyanide management be discussed in the Revised ESIA as a separate topic while addressing as a minimum the following sub-topics:

- The commitment to becoming a signatory to the ICMC;
- A cyanide balance sheet for the operation;
- Purchase and transporting of cyanide;
- Handling and storage of cyanide;
- Worker health, safety and training;
- Process plant operations including cyanide recycle and cyanide detoxification;
- Cyanide degradation in tailings storage facility;
- Criteria for the discharge of effluent containing cyanide to the treated water storage pond and to the environment;
- Monitoring and reporting;
- Mine closure and decommissioning procedures; and
- Emergency response procedures.

Surgold should clarify at what point in time the Merian mine will be applying for ICMI certification; i.e., will Surgold be applying for a conditional approval prior to the mine going into operation. In general, the Revised ESIA should contain a far more detailed and project specific discussion of the use of cyanide and cyanide management and monitoring.

### **3.2.3 PAG, Potentially Acid Generating Ore and Waste Rock**

It is well understood that metal leaching issues are exacerbated by the presence of acid generating materials at a mine site. In order to review this matter further following the site visit, we met with Golder Associates staff in Redmond, Washington. Based on these discussions and information currently included in the Draft ESIA report and its Appendices, it appears that this matter has been

well studied and that additional relevant information will be forthcoming when the Revised ESIA Report is submitted. It is possible that this matter (i.e., acid generation) is less of concern than we originally expected. We understand from our discussions with Golder staff, that, if pockets of acid generating material are encountered, Surgold will have a system in place to identify the potential for this problem early and will implement appropriate mitigative measures. Also, that Surgold are planning to monitor the effectiveness of the mitigation that is being implemented.

We expect that Surgold will include in the Revised ESIA an Environmental Management Plan that addresses the procedures to be implemented when/if acid generating materials are encountered. The findings of other Surgold studies and initiatives related to acid generation that are currently on-going will also be included in the Revised ESIA. It appears that the PAG issue is well in hand. On behalf of NIMOS, we anticipate reviewing and commenting on this matter further when the Revised ESIA is submitted.

### **3.2.4 Environmental Management Plans**

Surgold has committed in correspondence to NIMOS to preparing discipline specific Environmental and Social Management and Monitoring Plans (EMP's) for inclusion in the Revised ESIA submission. A list of EMP's is presented on page 25-55 of Volume II of the Draft ESIA. Since submission of the Draft ESIA, Surgold has provided an outline relative to the information that will be included in the EMP's. It is acknowledged that each EMP document is a *living document* and many plans will change over the duration of the project. However, it is important to have these documents available, at least in late draft form, when the Revised ESIA is submitted.

A Closure Phase Environmental Management Plan should be included on the list of plans. In addition, this subject should be addressed in more detail in the Revised ESIA. The discussion in Volume I (page 3-39) is very brief and relevant information from Volume III, Appendix 3E is not integrated into the body of the Draft ESIA Report. For any large project with a limited life, the closure phase is a significant part of the project. More details are needed with respect to project activities that take place at closure (e.g., what happens to unused chemicals, what happens to milling equipment and buildings, what operational changes are made to the Tailings Storage Facilities, sedimentation ponds, etc.). Monitoring activities during the closure period should also be discussed.

A comprehensive Environmental Monitoring Plan that applies to the construction, operational and closure phases of the project is needed. Surgold should include this plan in the Revised ESIA.

### **3.2.5 Table of Commitments**

Surgold should prepare a Table of Commitments that summarizes all the commitments made in the Final ESIA report in a user-friendly format. The table

should clearly indicate the issue each commitment relates to, the phase or phases of the project to which the commitment applies and the mitigation commitment itself. This table would evolve from the Table at the end of Volume II (i.e., Table 25-1). The Table of Commitments should address both environmental and socio-community commitments. This table will be important to NIMOS and the Government of Suriname and should be available when the Revised ESIA is submitted. Commitments need to be clearly stated and the intent/objective of each commitment needs to be clear.

## 4.0 CONCLUDING REMARKS

The Revised ESIA document, when available, is expected to address matters raised in the Draft ESIA review process, including matters raised in this document. New technical reports are currently being prepared by the Surgold team and are expected to be included in the Revised ESIA Report, most as Volume III Appendices. The findings from the new technical reports will need to be integrated into the text of Volumes I and II of the Revised ESIA Report. It is important that the Surgold team members responsible for submission of the Revised ESIA Report have adequate time to review the Revised ESIA document for completeness prior to its submission.

Appendix 1 (Comments Table) of this document contains comments and questions that relate directly to specific text in the Draft ESIA Report. They are provided to assist the Surgold team in their efforts to reach Final ESIA status with the submission of the Revised ESIA Report. The table lists a number of points that we recommend be addressed during the preparation of the Revised ESIA. Some of the points raised are easily addressed while some will likely involve Surgold commitments to address these matters during subsequent phases of the mine development process. An objective of our comments in Appendix 1 is to ensure that the Revised ESIA Report, when complete, convinces reviewers that implementation of environmental management practices for the Surgold project is feasible and that the environmental management practices, when implemented, will be effective.

Appendix 2 contains brief comments provided by the noise, air quality and socio-community specialists who participated on the Hatfield Draft ESIA review team.

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## **APPENDICES**

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**Appendix A1**  
**Comments Table**

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## COMMENTS TABLE

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b><i>Draft ESIA, Volume 1, Sections 1 to 6: Items Related to the Project Description and Baseline Conditions</i></b>				
1	Section 1.1.2	p. 1-1	"The ultimate design of the Project has yet to be finalized, allowing the results of the concurrent environmental, social, engineering and feasibility studies to be considered in the final Project design."	Although it is correct that the ESIA report is being prepared while design activities are underway, Surgold could state that it is pursuing an approval-in-principle from NIMOS based on the Revised ESIA Report and the information is believed to be adequate for this purpose.
2	Section 2.3	p. 2-13	Reference states that "Surgold will adopt the Environmental and Social Responsibilities (ESR) Standards and Policies of Newmont Mining Corporation" for the Merian Project	Web Link would be very useful and should be provided.
3	Section 2.4.5	p. 2-15	Regarding the International Cyanide Management Code (ICMC), Surgold will be signatory at process plant start-up and will be certified three years later.	It is understood that a Conditional Membership is possible and can be applied for during pre-operational (design) phase with the ICMC auditor reviewing the Project design before operation begins. Has this step been considered by Surgold? Will Surgold provide this commitment?
4	Table 3-1	p. 3-2	"Other disturbed areas totals 2644 ha".	Further breakdown of the 2644 ha in the "other disturbed areas" category would be helpful. Also for each category in the table, can the areas already highly disturbed by porkknockers be identified as well as areas where commercial logging has occurred. Also total does not add up to 4967 ha
5	Figure 3-2	p. 3-5	This is an important figure showing the location of facilities as they will exist late in the production life of the mine.	Improvements to this figure are recommended. For example, legend does not show blue line indicating creeks, TSF Phase 2 boundaries are not clear, industrial area boundary is not included. Where is the power plant located? In addition to this figure, has there been consideration given to presenting a figure illustrating what site development will look like after, for example, 2 years of operation?
6	Figure 3-3	p. 3-11	"Merian Gold Project Disturbance Sequence"	Figure and legend require editing. Is Year 1 disturbance area shown east of Central WRD correct? If yes, what is it?

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b><i>Draft ESIA, Volume 1, Sections 1 to 6: Items Related to the Project Description and Baseline Conditions</i></b>				
7	Section 3.3.2	p. 3-15	"Analysis of site materials to date suggests insignificant potential to generate Potentially Acid Generating (PAG) ore or waste, etc."	The Golder report (Volume III, Appendix 19-C) states "low probability" to encounter acid generating materials. Golder report is not referenced in text on page 3-15. However, for consistency, should it be stated as "insignificant potential" or "low probability"  Insufficient details are provided here regarding ARD potential; however, more complete information is presented in appendices. Reference should be made (here and anywhere else in this document where appropriate) to relevant information located in appendices
8	Section 3.3.5	p. 3-21	"Mitigation measures under consideration, etc. " near bottom of page	This is an important commitment. How will the need for the implementation of further mitigation measures be determined?
9	Section 3.4.1	p. 3-24	Power Plant sulfur emissions will be controlled by the use of low sulfur fuel, i.e., less than 2% S.	2% sulfur is not "low sulfur". Elsewhere it is stated that sulfur will be between .3 and .5%. Please clarify. Power plant location is not clear on figures. Where is it located?
10	Figure 3-7 and Figure 3-8	p. 3-31 and p. 3-35	Draft Water Management Scheme and Water Process Flow Diagram	Suggest improving these figures if possible. Stream names on Figure 3-7 would be helpful. Where are the "Waste Water Treatment Facility" and the "Treated Water Storage Pond" located on Figure 3-7?
11	Section 3-5	p. 3-29	"A more detailed Mine Water Balance is included in Appendix 3-D"	Conceptual not detailed, No quantities are presented, Directional arrows only
12	Section 3.5.1	p. 3-29	In-stream sedimentation basins and flocculent experimentation are referred to	Will there be an opportunity to prevent clean side hill runoff from entering the sedimentation basins. Also, what flocculants are likely to be used and will it be necessary to clean out sedimentation basins from time to time? The sedimentation basins are being planned in stream bottoms for which there is little if any runoff data for high rainfall periods. This matter should be discussed further.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b><i>Draft ESIA, Volume 1, Sections 1 to 6: Items Related to the Project Description and Baseline Conditions</i></b>				
13	Section 3.5.2	p. 3-33	<p>"Pit dewatering"</p> <p>"Based on preliminary geochemistry data and analysis conducted to date, the water quality of the pit dewatering is expected to meet Project design criteria"</p>	<p>Could include in discussion reference to PAG, is it a concern or not? "use of small lagoons downstream of sediment ponds" is mentioned. How will these lagoons function / operate/ be maintained.</p> <p>How realistic is this, i.e., significant downstream, in-channel works with very little rainfall and runoff data to support the engineering.</p> <p>This is different from what is said in Appendix 19-C which indicates that several metals will exceed standards.</p>
14	Section 3.5.3	p. 3-33	"Waste Rock Dump Runoff and Seepage"	Could include in discussion reference to PAG, is it a concern or not?
15	Section 3.5.4	p. 3-33	Tailings Water Management	<p>Could include in discussion reference to PAG, is it a concern?</p> <p>Tailings supernatant is discharged to a waste water treatment facility and then to treated water storage pond. Where are these located on figures such as 3-7, 3-8 and Appendix 3-D, Figure 2-1. Also text in Appendix 19-C is still to come and expected to be in the Revised ESIA</p> <p>Reference should be made to expected tailings water quality (currently reported as "to come" in Appendix 19-C).</p>
16	Figure 5-11	p. 5-23	Topography of Suriname	Show mine location. Same comment for Figure 5-12.
17	Section 5.4.1	pp 5-29 to 5-41	Seismic event would not result in damage to structure / buildings	Does this also apply to tailings pond dam structures
18	Section 5.2.4 and following,	p. 5-8 to p. 5-11	Figure 5-3 shows the temperature values...	Numbering is out of synch. Should be Figure 5-4. Rest of the references to figure numbers are also out by 1.
19	Section 5.2.6, Figure 5-7	p. 5-11	Wind speed scale of grey	Suggest use of colour as the grey scale did not show up clearly on screen nor when printed.
20	Section 6.1.1	pp. 6-7 to 6-12	Tables 6-1 to Table 6-7	A table showing the resulting baseline values is missing. It is in Appendix 16-B, Section 3.4, Table 4, page15 and should be included in the main report.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 1, Section 9: Water Resources Baseline</b>				
1	Section 9.1, footnote 5	p. 9-6	The exact locations of the streamflow stations are not provided.	The reference should be to the Langa Tabiki rainfall station, not the streamflow station.
2	Section 9.1, and Figure 9-2	p. 9-7 and p. 9-8	The distribution of the Merian site's .....evaporation (adjusted with the pan coefficient) rates ... are presented in Figure 9-2.	The plotted evaporation data in Figure 9-2 appear to be pan values from Table 4-1 of Appendix 3-A (i.e. without adjustment for pan coefficient). The pan coefficient adopted for use of these data at the Merian site should be provided.
3	Section 9.2.1, and Figure 9-3	p. 9-11 and p. 9-9	Streamflow has not been historically measured on the Commewijne, therefore, a regional analysis is required to predict streamflows on the river.	Figure 9-3 appears to show a stream gauge (gauge 16) on the Commewijne. While data from this gauge may not add to the analysis, availability of data should be checked and the statement modified if necessary.
4	Section 9.2.2, and Figure 9-6 (and possibly other figures)	p. 9-18 and p. 9-19	A3 Creek and Tempati Creek are both currently subject to active ASM mining. Signs indicate that ASM mining is also active on the main stem of Las Dominicanas Creek.	We understand that Surgold only has exclusive control over the "Industrial Area" and that areas outside the Industrial Area but within the Environmental Study Area will continue to be subject to ASM mining. The Industrial Area should be shown on Figure 9-6 and discussed in the text.
5	Figure 9-6	p. 9-19	Project Creek and Basins	The figure shows waste rock piles intruding into the main stem of Merian Creek. We understand that this is not what is proposed. This and other figures (e.g. Figure 9-9) should be revised accordingly.
6	Figure 9-9	p. 9-25	Surface Water Monitoring Locations	The figure should be revised to more clearly show monitoring locations: SW27 is not shown on a stream SW35 and SW37 appear to be same point SW36 (referred to in Table 9-3 is missing) SW21 location should be confirmed SW13 appears twice SW15 appears twice This may not be a complete list of problems.
7	Section 9.2.2	p. 9-29	Despite difficulty establishing high-flow rating curve data, low flows have been generally well measured and are reported with confidence.	It should be reiterated that at the time of writing low flows have only been collected for one dry season and sufficient data are not available to put the observed data in to a longer term context. Furthermore, some of the stream gauge stage-discharge ratings (provided separately) are not well defined even for low flows, leading to further uncertainty in discharge estimates (see also comments on Appendix 3-B concerning stage-discharge ratings).

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 1, Section 9: Water Resources Baseline</b>				
8	Section 9.2.2	p. 9-29	The streamflow estimates for the main creeks in the Las Dominicanas watershed are provided in Table 9-5. The exact locations on each creek at which flows are estimated are also provided in Appendix 9-B.	It is not clear that the locations are provided in Appendix 9-B as indicated. Locations should be provided in the main report (possibly on Figure 9-9).
9	Section 9.2.4, and Figure 9-15	p. 9-32, and p. 9-33	While high flows remain very approximate estimates, low flows have been well measured and baseflow characteristics can be estimated given the data available. (Refers to Tomulu Creek, SW-4B)	Peak flows at SW-4B (reported catchment area of 19.6 sq km) as shown in Figure 9-15 are very suspect. Some flows exceed 100 m <sup>3</sup> /sec and appear to be implausible.  As noted in comment 7, there is only one dry season of low flow data and no indication how these data fit into a longer term context (e.g. wet, normal or dry year). The data cannot therefore be claimed to reliably characterize baseflows expect for those within the short monitoring period.
10	Table 9-9	p. 9-35	Predicted streamflows in Merian Creek watershed	Table heading should be corrected. Drainage area reported for Merian Creek at SW-34 is not consistent with area reported in baseline hydrology report.
11	Section 9.3 Water Quality	p. 9-35	Methods, locations, dates of water quality surveys are lacking	Detailed methods, sampling locations, dates should be reported completely.
12	Section 9.3 Water Quality	p. 9-35	Any seasonal variations in water quality are not reported.	If major seasonal variation in WQ exists, this should be reported.
13	Figure 9-19	p. 9-39	Existing disturbed areas within the study area	Please add the Industrial Zone boundary and date of the photo (2010 per page 9-37).
14	Section 9.3.2, and Figure 9-20	p. 9-51 and p. 9-41	Upper Merian Creek summary data includes data collected at all of the Merian Creek tributaries (labeled Merian Creek Tributary #1 - #4 on Figure 9-20).	Merian Creek tributaries are not labeled on Figure 9-20.
15	Table 9-12	p. 9-48	Summary of total metals...	Dissolved metals data also should be reported where possible, given the high TSS will confound total metals results and that use of total metals only does not allow estimation of bioavailable fraction.
16	Table 9-13	p. 9-49	List of water quality exceedences at SW-27	It is unclear which set of EDC standards is used in this table for comparison (i.e., from the supplemental EDC or the previous version). Some metals of concern listed at the top of pg. 9-49 (e.g., Al, Cr) are not included in this table or screened against standards.
17	Section 9.5	p. 9-61	Cross sections depicting the stratigraphy across the site are presented in Appendix 9-B Figures 4 –11 to 4 – 16.	Figures 4-11 to 4-16 do not appear in Appendix 9-B. Please provide the correct reference.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 1, Section 9: Water Resources Baseline</b>				
18	Section 9.5.1, Table 9-23, and Figures 9-34 to 9-36	p. 9-79, and pp. 9-81 to 9-83	Groundwater elevations	Improved presentation and additional interpretation of the figures would be helpful.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 1, Section 11: Terrestrial Resources baseline</b>				
1	Figures 11-6 and 11-7	p. 11-24	Vegetative Sp. Richness vs. Abundance of Climax and Pioneer Sp.	It does not seem appropriate to use regression analysis when the y-axis range is so narrow (i.e., 0 to 3 species) as to be more categorical than parametric.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 1, Section 12: Aquatic Resources baseline</b>				
1	Section 12 (general)		Methods, locations of aquatic ecology surveys are lacking	Detailed methods, sampling locations, sampling dates should be reported.
2	Section 12 (general)		Linkages between aquatic biota (esp. fish) and specific locations/habitats within/outside footprint are not reported.	Aquatic habitat types and use by different aquatic biota (particularly rare fish species) should be reported explicitly. (There is some information of this type in the Appendices that could be carried forward.)
3	Figure 12-5 Sites with Special Status Species		This figure does not report any special-status aquatic species within stream of the mine footprint, although this is reported in appendices.	Known/likely presence of special-status fish within the mine footprint should be presented and discussed.
4	Metals in fish	p. 12-11	Species/size/life-history of fish species used in metals analysis not stated.	Especially for mercury (which exhibits high tissue concentrations in the study area), fish size and habit are important factors affecting tissue concentration. Species, size and habit of fish used for metals testing should be reported here. Specific locations of sites sampled for tissue metals also should be presented (any from within the mine footprint/ASM areas?)

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume I, Section 14: Social Baseline</b>				
1	Section 14.1.3	p. 14-4	A project "Social Study Area" has been defined focusing on those areas where interactions and impacts of the project are likely. Four areas are listed.	The four areas listed (page 14-5) may be the only areas impacted, but it unclear from the analysis. Clarity would be provided by a table listing all the regions by all the socio-economic measures and reporting on the likely impact in each area. The conclusion may be as reported but this approach would provide rationale for the social study area.
2	Section 14.1.4	p. 14-5	Due to the range of topics included in the socio-economic analysis, the report is structured to describe only those issues that are deemed relevant to the mine's development and operation. The issues vary depending on the region being studied.	There are several topic areas being considered (see page 14-6), and several geographic areas within the social study area (see page 14-5). A matrix depicting which topics are being reported/analyzed in which regions would provide additional clarity. A significance rating scale could be considered.
3	Section 14.1.5	p. 14-10	This "structure of the report" section lists the social topic areas that are considered, "where relevant".	The relevancy issue should be addressed with the table described above. This would provide an understanding of the rationale that lead to some topic areas being deleted.
4	Section 14.4.1		Moengo area is less directly affected than the Pamaka area, and therefore fewer topic areas are covered.	Provide a checklist/significance assessment of all topic areas, including those not covered, and why.
5	Section 14.5		Tempati and Commewijne Area are also less affected than the Pamaka area, and topics considered not to be impacted are not addressed.	Provide a checklist/significance assessment of all topic areas, including those not covered, and why.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 16: Air Quality and Greenhouse Gas Impacts</b>				
1	Section 16.1.3, Conclusion	p. 16-32	Receptors such as residences, schools and house of worship located along the corridor will likely experience increased air emissions, particularly fugitive dust....expected to be insignificant...no specific mitigation.	Although mitigation is not recommended at this time, a TSP monitor located at one of the "sensitive receptors" would be warranted to confirm the impact is insignificant.
2	Section 16.1.3, Conclusion, Mitigation Measures	p. 16-32	Perform daily visible fugitive dust checks on all active mine haul roads, stockpiles, and material transfer points.	Suggest a hand held PM monitor would be useful to provide a value as well as a visible check.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 16: Air Quality and Greenhouse Gas Impacts</b>				
3	Section 16.1.1	p. 16-3	Summary of Background	A table showing the resulting baseline values is missing. It is in Appendix 16-B, Section 3.4, Table 4, page 15 and should be included in the report.
4	Section 16.1.3, Modeling Results	p. 16-11	Discussions of impacts on settlement areas.	The summary tables 5A to 5D, pages 18 and 19 of Appendix 16-B would help understanding of impacts on settlement areas.
5	Section 16.2.2, Table 16.5 and following text	p. 16-37	In the table - Year 1 annual total GHG emissions 367,650 tonnes/year. The following text- Therefore, the GHG impact ... will be minor	The conclusion is true based on the guideline of 25 kg CO <sub>2</sub> e per tonne of ore processed. The baseline study, Section 6.2 page 6-13 shows Suriname net GHG emissions of 5,040 Gg CO <sub>2</sub> e. The mine could increase Suriname's GHG emissions by up to 7%. This is not insignificant and should be stated.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 19: Water Resources Impacts</b>				
1	Section 19.1, and other references throughout this Chapter.	p. 19-2	Water quantity impacts were evaluated based on changes from baseline flow conditions.	Given that at the time of writing there was very little observed baseline flow data and no observed wet season baseline flow data, we assume that all references to baseline flow data are to synthetic (i.e. modeled) data. This should be made clear in the methodology Section 19.1 and a discussion provided as to how the applicant proposes to incorporate observed flow data into the analysis once it becomes available. Further, given the very short period of baseline flow data likely to be available for analysis, uncertainty in flows should be considered. This would apply to both water quantity impacts to streams and the development of project design discharges.
2	Figure 19-1	p. 19-4	Water balance concept.	<p>a) According to the baseline hydrology report, gauge SW-27 was not installed but it appears that water quality data were sampled at this location. A note should be added that water quality data only are collected at SW-27.</p> <p>b) 80% of surface water from West WRD is directed <b>without</b> treatment to the treated water storage pond. Is no treatment being proposed?</p> <p>c) Is make-up water required and if so where will that come from?</p>

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 19: Water Resources Impacts</b>				
3	Figure 19-2	p. 19-6	Water management scheme.	<p>a) The figure should be edited to improve legibility. In particular, the creek system is illegible and the depiction of the groundwater divide is unclear.</p> <p>b) The legend shows pond 5 as a treated water storage pond. We assume this should be pond 7 only.</p> <p>c) There is no explanation or mention of phasing of the TSF in Section 19. Some discussion of phasing should be provided.</p>
4	Section 19.1.1	p. 19-8	Four representative periods were evaluated by the model.	Commentary should be provided on differences between pristine conditions and current baseline with ASM impacts.
5	Section 19.1.2	p. 19-10	Environmental design criteria.	To the extent feasible, water quantity design criteria should also be provided.
6	Section 19.2.3	p. 19-14	Pre-Production clearing, grubbing, stripping, earth moving, re-grading, and dam and structure construction activities will result in ground disturbance and increased Total Suspended Solids (TSS) loadings.	Please provide a figure showing the maximum extent of clearing relative to baseline clearing (see Figure 9-19). Also provide a tabulation of cleared area by watershed. (See also comments on Appendix 3-D).
7	Section 19.2.3	p. 19-15	The severity of TSS-related impacts.....are expected to be low due to....4) local biota and habitat acclimation to seasonally elevated TSS levels.	Is there any evidence of such acclimation?
8	Section 19.2.4	p. 19-16	Once the tailings dam is completed all surface water runoff above the dam will be ponded behind the dam and pumped to Tempati Creek ; this action will reduce the streamflow in the A3 Creek.	Is water pumped from the TSF to Tempati Creek via the Treated Water Storage Pond? An explanation should be provided for why flows are not retained in A3 Creek.
9	Section 19.2.4	p. 19-17	Stormwater management best practice is considered to include maintaining post-development peak flows to meet pre-development flow rates	The document should clearly state what stormwater quantity design standards and BMPs are proposed for implementation.
10	Section 19.2.4	p. 19-17	Dry and wet year estimates represent average monthly flows associated with monthly precipitation rates that are exceeded (based on annual recurrence intervals) 95 percent of the time for dry years and 5 percent of the time for wet years.	Please provide a table of assumed monthly precipitation for dry, normal and wet years.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 19: Water Resources Impacts</b>				
11	Section 19.2.4, and similar water quantity discussions elsewhere in Chapter 19	p. 19-17 through p. 19-19	Changes in streamflow regime.	Analysis of changes in streamflow regime is restricted to estimated changes in average monthly streamflows for normal, wet and dry years. Analysis and discussion should be expanded to include changes in peak flows.
12	Section 19.2.4,	p. 19-17 and p. 19-19	Sediment control structures included in the Project design will provide some limited attenuation of peak flows (page 19-17) Recommended mitigation ... includes an optimization of the detailed design of the sediment control structures to control peak flows to match or at least approach peak flow conditions, where feasible. (page 19-19)	Specific peak flow control standards proposed to be met by the Project should be provided (see comment 9).  In our experience a facility designed for sediment control is generally incapable of providing peak flow control except perhaps for quite small events. Please comment.
13	Section 19.2.4	p. 19-19	Other mitigation would include development and implementation of an Erosion and Sediment Control plan that includes BMPs designed to reduce peak flow rates	Please indicate what ESC BMPs are proposed to reduce peak flow rates.
14	Section 19.2.4	p. 19-19	Implementation of these various mitigation measures is expected to reduce the potential severity of streamflow impacts at the Study Area Boundary to low and decrease the overall impact rating to minor.	Increases in monthly flows on Las Dominicanas Creek are projected to range from 10.6% in May to 73.9% in September (Table 19-1). There is no discussion of potential change in peak flows. It is not clear with the presently available information how the severity of impact can be assessed as "low".
15	Section 19.3.2	p. 19-23	An additional measure that will be implemented to reduce potential TSS loadings will be the progressive and concurrent reclamation of WRDs and other disturbances. This will serve to reduce the total area of exposed disturbance at any given time, reducing overall sediment contributions to runoff.	Estimate of total disturbed area as a function of time should be provided from present baseline through end of operations.
16	Section 19.3.3	p. 19-24 to 19-27	Changes in streamflow regime (operations impacts on surface water)	See comment 11.
17	Section 19.3.3	p. 19-27	Recommended mitigation to address Operations phase streamflow impacts includes an optimization of the detailed design of the sediment control structures, if practicable, to reduce peak flows to match or at least approach peak flow conditions, where feasible.	Specific peak flow control standards proposed to be met by the Project should be provided (see comment 9). The feasibility of providing necessary mitigation should be confirmed.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 19: Water Resources Impacts</b>				
18	Section 19.3.3	p. 19-27	Implementation of these various mitigation measures is expected to reduce the potential severity of streamflow impacts at the Study Area Boundary to low and decrease the overall impact rating to minor.	Increases in monthly flows on Las Dominicanas Creek are projected to range from 20.4% in June to 128% in October (Table 19-3). Increases on Merian Creek (Table 19-4) are projected to range from 11.3% in June to 49.3% in October. There is no discussion of potential change in peak flows. It is not clear with the presently available information how the severity of impact can be assessed as "low".
19	Section 19.3.4	p. 19-28	During baseflow conditions, an estimated 42% of the streamflow at EP-A0 will be impacted by the Project.	Meaning is unclear. Please rephrase.
20	Section 19.3.4	p. 19-29	Groundwater modeling indicate that seepage collection systems may be capable of intercepting from between 27 to as much as 81 percent of the TSF seepage flow.	Are the percentages quoted indicative of uncertainty in groundwater modeling or do they reflect percentages for different mitigation (seepage collection) options?
21	Section 19.3.5	p. 19-32	The WRD seepage and runoff will be conveyed to sediment ponds prior to discharge where physical settling will further reduce total metal concentrations. Other runoff from nearby undisturbed areas and pit water will also be conveyed to the same sediment ponds.	Routing runoff from undisturbed areas to a sediment pond reduces the efficiency of the pond and is contrary to best management practices. Please explain why runoff from undisturbed areas is proposed to be conveyed to the sediment pond.
22	Section 19.3.5	p. 19-32	During low flow conditions, if determined necessary, the site water would be routed through constructed lagoons located downstream of the sediment ponds. These lagoons would treat the water to reduce nitrates and ammonia concentrations prior to discharge to the upper reaches of Merian Creek	Have the necessary calculations been performed to determine whether it is feasible to provide lagoons of the size necessary to achieve treatment targets given physical site constraints?
23	Section 19.4	p. 19-34	Closure impacts on surface water	Impacts should include adjustment of stream morphology to changed streamflow regime.
24	Section 19.4	p. 19-34	Closure impacts on surface water	Impacts cited include "water overflow from mine pit lakes". Given the estimated time to fill the pits (25 to 30 years for Merian II and Maraba) has it been determined whether pit overflow is a closure or post-closure impact?
25	Section 19.5, Table 19-6	p. 19-36 and p. 19-37	Streamflow in the Las Dominicanas watershed will be slightly higher than baseline and streamflows in the Merian watershed will be slightly lower.	Table 19-6 shows decrease in Merian Creek dry season monthly flows of up to 34%. This seems like a potentially significant impact and warrants further discussion, including assessment of what length of water course might be affected by such reductions, and the impact of flow reduction on stream morphology, aquatic habitat etc.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 19: Water Resources Impacts</b>				
26	Section 19.5	p. 19-36	This minor change in streamflow regime is due to the minor change in the respective drainage areas of these two basins.	Please provide a summary table of baseline and post-closure drainage areas at key locations.
27	Section 19.5	p. 19-36 to 19-37	General comment	Please describe how post-closure overflow from mine pits will be handled. Will there be an overflow structure (e.g. a weir), will a channel be constructed to convey pit overflow to an existing downstream creek? Similarly for the TSF. For the TSF, are any restoration activities proposed which affect post-closure water resource impacts?
28	Section 19.5.2	p. 19-39	Residual Impact Assessment	Should refer to Merian Creek and not to Las Dominicanas.
29	Chapter 19		General comment	While the focus of Chapter 19 is on water resource impacts at the Environmental Study Area boundary, discussion of significant impacts within the study area should be provided, for example, the projected large increase in flows on Tempati Creek during the years of project operation (see monthly flows in Appendix 3-D). A summary should also be included of physical changes within the project area from baseline to post-closure. For example: length of water courses lost; length of water courses restored; length of water course affected by reduced/increased flows; change in tributary areas; etc.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 21: Biological Resources Impacts</b>				
1	Section 21.5.9 (Metals in streams)	p. 21-39	"It is impossible to predict the extent and severity of specific impacts [of metals in A3 Creek from TSF seepage/discharge] without additional modeled concentrations and distributions."	Modeled TSF discharges (reported as information that will be included in finalized Appendix 19C report) should be used to address this question.
2	Section 21	sections associated with WQ effects on aquatic life	Susceptibility of aquatic biota to changes in water quality	The very low hardness and alkalinity of local waters should be considered when predicting potential impacts of discharged dissolved metals and ions (such as sulfate), given many of these chemicals are much more toxic at very low hardness.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 22: Impacts on Land Use</b>				
1	Section 22.2.2 and 22.5	p. 22-2 and 22-3	References to sections 22.2.1.2 and 22.2.1.3	Presumably these sections will be included in the revised ESIA

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Volume 2, Section 23: Social and Health Related Impacts</b>				
1	Section 23	p. 23-4	The description of the assessment process involves some derived findings based on significance of the impact and the likelihood of it occurring.	A chart describing the measures of impact likelihood from low to high and of significance (severity) from minor to major would augment the textual explanations, and provide a visual depiction of the analysis system. This chart could also differentiate between the positive and negative impacts. Explanation of the receptor sensitively measure and its range is also required.  Note: The impact rating matrix is presented in the Cumulative Effects Assessment (see 25.1).
2	Section 23	p. 23-4	The analysis process also creates a measure of the significance and likelihood of impacts after mitigation.	The range of impacts should also be described and charted.
3	Section 23,	p. 23-4	Social and health impacts describe issues under four headings.	The last two topic areas – mitigation measures and residual impact assessment are not consistently titled within the ensuing sections. Mitigation measures are referred to as Management and Enhancement Measures (See 23.1.3, page 23-7), and Residual Impact Assessment as Enhanced Impact Assessment (see 23.1.4, page 23-8). Consistency is required. Check the other chapters within Section 23.
4	Section 23.12.4	p. 23-49	Information on thirteen separate topic areas is presented in this section. Two of the four assessment measures are calculated or devised measures based on the significance of the impact and its likelihood of occurring.	The analysis would benefit from a summary matrix of the findings of the four measures against the thirteen topic areas.
5	Section 23.5.2	p. 23-22	Report states: Error! Reference source not found	Error needs to be corrected.
6	Section 23.7.2	p. 23-31	Box 234 mislabeled	Correct

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 3-D: Merian Site-Wide Water Balance Model</b>				
1	Section 2.0	p. 1	The numerical model is probabilistic and generates precipitation realizations that are statistically similar to historical precipitation.	A clearer introduction to GoldSim and its use on the Merian project should be provided. In Section 3.0, it is stated that “the stochastic portion of the precipitation model was not used”. We infer from that statement that GoldSim was not used as described in the quoted introductory paragraph in Section 2.0.
2	Section 2.1.1.1	p. 2	In the Climate Summary (Golder 2012a), monthly precipitation values were developed for wet, dry and average precipitation conditions.	The monthly precipitation values used to represent wet, dry and normal conditions should be provided here and in Appendix 9-A.
3	Section 2.1.1.1	p. 2	The monthly [precipitation] estimates were converted to daily values, assuming the same precipitation each day of the month, for use in the model. These precipitation values are primarily used for predicting streamflows at the evaluation points for the ESIA.	The assumption that the same precipitation occurs each day of the month is an extreme simplification and may result in significant understatement of runoff amounts if used in a daily time-step rainfall-runoff model having a reasonable physical basis.
4	Section 2.1.1.2	p. 2	Stochastic Precipitation	In Section 3.0, it is stated that “the stochastic portion of the precipitation model was not used”. While it would be worth retaining this Section 2.1.1.2 for future reference, the statement that this portion of the model was not used in the ESIA should be made at the beginning of this section.
5	Table 2-1	p. 3	Pan Evaporation Factors	We agree with the selected open water pan evaporation factor of 0.75, but note that a lower factor is used elsewhere (e.g. in the pit lake water balance model). A consistent value should be used throughout.
6	Section 2.2.1, and Figure 2-2-1 through Figure 2-2-22	p. 3	Figures 2-2-1 through 2-2-22 show the changes in the drainage basins over the life of the mine.	Figures 2-2-1 through 2-2-22 are a powerful way of showing changes at the site over time. It would be useful to also provide a tabulation of changes in cleared/excavated areas over time, so that, amongst other comparisons, future changes relative to past ASM activities can be assessed.
7	Section 2.2.2	p. 4	The runoff coefficient for the jungle category varies by month. The values are based on model verification, matching an annual average runoff of 90 centimeters (cm), during a 238-cm (average)-precipitation year. The runoff coefficients for harvested, cleared, and excavated areas are based on professional judgment. As more site specific data becomes available, these coefficients will be adjusted.	Given the current extremely limited baseline streamflow data, we suggest that runoff coefficients for jungle areas will also undergo further verification and adjustment as site data become available. The basis for the assumed average annual runoff of 90 cm for jungle should be explained.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 3-D: Merian Site-Wide Water Balance Model</b>				
8	Section 2.4.2	p. 6	Target volumes were selected to maintain a maximum water treatment pumping rate of 3000 m <sup>3</sup> /hr with a low probability of overtopping the TSF.	Please indicate what is meant by “a low probability of overtopping”.
9	Section 2.5	p. 7	During Post-Closure, it is assumed that the pits are full, and are no longer discharging to the environment.	Please clarify. Once the pits are full, they will be discharging (overflowing) to the environment.
10	Appendix 3-D		General comment	We were expecting to see more quantitative information on the different components of the site water balance. We would be particularly interested in seeing water balance accounting for the TSF to better understand the relationships between storage in the TSF, plant water requirements, treatment plant capacity, and discharge to the environment.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 6-A: Baseline Ambient Air Quality Monitoring Report</b>				
1	Executive Summary and elsewhere in report.	p. vi.	PM2.5 was measured ... using Met One E-Samplers.	Although these are fine samplers they are susceptible to high humidity which can produce erroneously high readings. Did the data show unusual increases when the RH was over 90%?
2	Section 3.2	p. 14	Tables of Summaries	A summary table such as Appendix 16-B, Section 3.4, Table 4, page 15 and should be included.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 9-A: Climate Summary</b>				
1	Section 2.1.2, and Table 2-1	p. 2	... there were three months (March 2010, January 2011, and February 2011) omitted from the record because each month was much lower than the long-term average...	It appears that March and April 2011 may also have been omitted from Table 2-1 because of unreasonably low values.
2	Section 2.1.2 and Table 2-1	p. 3	The measured average monthly precipitation varied from 281 mm (May) to 91 mm (September).	From Table 2-1, the low end of the quoted ranges should be 75 mm.
3	Table 2-1	p. 3	March 2010	The very low monthly rainfall amount reported for March 2010 was reported on page 2 to have been omitted from the record (see comment 1), however it still appears in Table 2-1 and in the computation of average monthly rainfall. Given the very low value relative to monthly values recorded elsewhere (e.g. at Alliance) it would seem appropriate to exclude this value from Table 2-1.
4	Section 2.2.1	p. 3	A plot of simultaneous monthly total precipitation .... shows a poor correlation (correlation coefficient = 0.33).	The low correlation of monthly data is surprising given the proximity of the stations at Merian and Langa Tabiki. It would be helpful to provide the referenced plot.
5	Section 2.2.2.1	p. 4	The Alliance gauge has 99 years of daily precipitation data and provides the best estimate of and statistics for long-term precipitation in Suriname.	Please provide monthly rainfall data for the period of record for Alliance.
6	Table 2-2	p. 5	Mean monthly precipitation at Merian Site	A more complete picture of the precipitation regime should be provided. Please provide estimates of the standard deviation and range of monthly rainfall values based on the transposition of data from Alliance to the Merian site. Elsewhere (Chapter 19 and Appendix 3-D), reference is made to monthly rainfall amounts for wet, normal and dry years. These estimates should be provided in this Appendix.
7	Section 2.3	p. 6	..extreme value precipitation at the Merian site was estimated using the existing gauges coupled with generalized regional (Caribbean) precipitation relationships.	There is no subsequent reference to Caribbean data, however regional data from the southeast USA were apparently used. While we appreciate the rainfall data limitations in Suriname it seems extreme to have to rely on data from the southern US. Have other possible data sources been fully explored? The reference to Caribbean data is misleading and should be corrected.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 9-A: Climate Summary</b>				
8	Section 2.3.1	p. 6	The depth-duration-frequency (DDF) estimates for Alliance and Langa Tabiki gauges were calculated for the 24, 48, and 72-hour durations.	Please provide frequency plots. DDF analysis extends to durations of 72-hours. Is DDF analysis required for longer durations (e.g. 5-day, 10-day, 15-day) considering the storage and outflow characteristics of large storage facilities such as the TSF?
9	Section 2.3.2	p. 7	Storm durations of 30-minutes or less were calculated from the 5-minute precipitation data; storm durations of 1 hour or more were calculated from the hourly precipitation data.	Maximum 60-minute rainfall amounts do not generally coincide with maximum hourly amounts having a fixed observation time. An upward adjustment to the hourly amounts may be needed in the same way that observation day amounts are adjusted upwards to convert from 1-day to 24-hour maxima.
10	Figure 2-5		Depth-duration-frequency data for Alliance	The Alliance 50-year and 100-year 48-hour precipitation amounts appear to be identical. Similarly, the 50-year and 100-year 72-hour amounts are almost the same. Is this correct?
11	Section 2.3	p.6 through p. 8	General comment	Given the scarcity of climate data, there is clearly considerable uncertainty in estimates of design rainfall amounts. This uncertainty should be considered in the adaptive water resource management plan.
12	Section 2.3.2, and Table 2-3,	p. 7- 8	Precipitation depth-duration-frequency at Merian site	Given the relatively large amount of missing rainfall data at the Merian site, please comment on the risk that the data analysis will understate site short duration rainfall intensities.
13	Section 2.3.5.3.3	p. 11	For design of facilities like the Merian Project TSF, the total depth of precipitation over the course of a long duration storm becomes the controlling parameter since the entire volume of runoff from the storm must be stored. Therefore 72-hour PMP values were estimated.	We agree that long-duration storm depths are likely the controlling parameter in determining facility response to extreme storms. However it not clear what duration is critical. Consideration should be given to longer period events. We expect that the critical period would be related to facility design features such as the storage capacity of the TSF and the pumping capacity from the TSF to the water treatment facility. Discussion should be provided either here or elsewhere in the ESIA of how extreme value rainfall amounts (including PMP) will be used in project design.
14	Section 4.0	p. 14	Lacking local evaporation data for the Merian site, evaporation data from the Rosebel Gold Mine were applied.	Given the difficulties in monitoring evaporation data elsewhere, have the Rosebel data been reviewed for reliability? Chapter 9, Section 9.1 of the main report references pan evaporation data from 4 other sites in the country. That information should also be included in Appendix 3-A so all relevant climate data can be found in one location.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 9-A: Climate Summary</b>				
15	Section 4.0	p. 15	...the pan coefficient is approximately 0.5 to 0.6 in Suriname.	The quoted pan coefficient seems very low. What pan coefficient was adopted for Merian and what are the implications of error or uncertainty in the pan evaporation data?

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 9-B: Baseline Hydrology Report</b>				
1	Section 3.0	p. 4	Las Dominicanas Creek flows into a tributary of the Commewijne River approximately 3 kilometers (km) below the northern-most monitoring station on Las Dominicanas Creek (SW-29).	Station SW-29 is shown in Figure 2-2 on Tempati Creek not on Las Dominicanas Creek.
2	Section 3.0	p. 4	Merian Creek flows into the Marowijne River approximately 4 km below the lowermost monitoring station on Tomulu Creek (SW-4A).	Station SW-4A is shown in Figure 9-9 of the main body of the ESIA report as being on Merian Creek. It would be helpful if all referenced monitoring stations were shown in Figure 2-2 of this appendix.
3	Section 3.1	p. 4	The available flow data for the Commewijne River is limited...	There is no subsequent reference to flow data on the Commewijne River. The gauge site should be shown in Figure 2-1 and details provided in Table 3-1 and other relevant locations.
4	Section 4.0	p. 8	SW-38 was located on North Fork (NF) A3 Creek ....	Figure 2-2 shows SW-38 on the South Fork A3 Creek.
5	Section 4.0, and Table 4.1	p. 8-9	Gauge SW-30	No information is provided on the record at SW-30. With the abandonment of stream gauging activities at SW-27, baseline data from SW-30 takes on additional importance. Discussion of available data should be included in the document.
6	Section 4.4, and Table 4-3	p. 10	Flow data for Merian Creek gauge SW-34	Reported monthly baseflow and monthly unit-area baseflow are inconsistent with baseflow reported in cm. Reference to December 2012 should be to December 2011.
7	Section 4.5, and Figure 4-3	p. 11	Flow data for North Fork A3 Creek gauge SW-35	The section incorrectly references Figure 4-4 (should be 4-3). Figure 4-3 is incorrectly labeled as Figure 4-2.
8	Section 5.3	p. 17	The manual [flow] measurement correlates closely with the transducer data, and both indicate a peak discharge of approximately 0.24 m <sup>3</sup> /sec.	Unclear. Is this saying that the manual flow measurement agreed closely with flow determined from the gauge rating given the water level measured using the transducer?

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 9-B: Baseline Hydrology Report</b>				
9	Section 5.4	p. 17	Peak flows can be estimated using rainfall-runoff models that rely on the precipitation-depth-duration frequency data....	The ability to use rainfall-runoff models to estimate peak flows on small catchments with any degree of confidence will depend on the availability of observed flow data for model calibration. See also comments on rainfall depth-duration-frequency data under Appendix A – Climate Summary.
10	Section 6.3, Figure 6.7		Estimation of total suspended sediment concentrations at gauge SW-37.	X-axis for Figure 6.7 should be corrected – units are presumably (m <sup>3</sup> /sec/km <sup>2</sup> ). It is not clear how the regression equations shown relate to the linear fits plotted given that this is a log-linear plot. Assuming the data are plotted correctly, it is unlikely that the correlation coefficient for the manual measurements is >0.99.
11	Figure 4.1		SW-4B Streamflow Hydrograph	Peak flows seem implausibly high (in excess of 100 m <sup>3</sup> /s). Suggest adding a note or disclaimer to this figure (and possibly others) giving range of reliable flows.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 14-A: National and Regional Social Summary</b>				
1	Section 1.2	p. A3	Table A-2 reports Dutch ethnic diversity at 11.68%, while pie chart indicates the proportion closer to 50%.	Confirm statistics and match legend to pie chart proportions.
2	Section 1.3	p. A11	Suriname Business Council or Coalition	Both terms used.
3	Section 1.4	p. A11	Employment data reported for 2004. Most of the other demographic statistics are more current.	Use more current information, if available.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 19-B: Pit Lake Water Balance Modeling</b>				
1	Section 1.2.1	p. 3	Average Annual Pan Evaporation ..... A pan coefficient of 0.55 is applied to estimate open water (pit lake) evaporation.	A pan coefficient of 0.55 is unusually low compared with published values for humid semi-tropical regions. Published pan coefficients for Florida are in the range 0.72 to 0.76. In the absence of a substantiated basis for the pan coefficient of 0.55, as used at the Rosebel Mine, we would recommend using a more typical value and documenting the consequences, if any, of uncertainty in the assumed open water evaporation rates.
2	Section 1.2.1	p. 3	Average Annual Evapotranspiration (Reclaimed Open Pit Area) – estimated to be 0.45 m/yr ....	Please further explain the basis for the estimate of 0.45 m/yr.
3	Tables 2-1 and 2-2		Merian I (North Pit) Pit Lake Water Budget and Merian I (South Pit) Pit Lake Water Budget	The water budget spreadsheets for Merian I North Pit and South Pit after Year 1 do not correctly account for rainfall on and evaporation from the pit lake water surface.
4	Tables 2-3 and 2-4		Merian II and Maraba Pit Lake Water Budgets	The spreadsheet calculations show groundwater inflows reaching equilibrium in Year 12 for Merian II and Year 15 for Maraba. This is inconsistent with the statement in the text (Section 1.2.2) regarding a linear decrease in groundwater inflow from the end of mining to the year in which the pit lakes reach their overflow elevation. However the spreadsheet calculations may be more realistic given the non-linear rate of rise in pit lake water levels.
5	Figures 1-3 and 1-4		Pit water volume vs. elevation and pit water elevation vs. area	Please show data for Merian I in separate figures appropriate to the smaller scale of the Merian I pits.
6	Appendix 19-B		General comment	It would be useful to provide here and in the main body of the text brief discussion of the implications of pit refill time and uncertainty in pit refill time. Presumably once the pit overflow level is reached there will be a change in the hydrologic regime of the downstream water course and a possible change in water quality.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Appendix 19-C: Geochemical Baseline and Source Water Quality</b>				
1	General		Contents of this appendix are not always consistent with contents of ESIA Volumes 1 and 2.	Information in relevant sections of Vols. 1 and 2 should be reconciled with information in this appendix.
2	Section 4.4.3		TSF water quality has not yet been modeled (“to be reported in final document”)	This is critical information required for effective impact prediction. It should be reported and used to formulate effects predictions.

#	Section #	Page #	Information Presented in Draft ESIA	Review Comments
<b>Environmental Design Criteria (supplemental document)</b>				
	EDC General		This EDC document contains what appears to be numerous commitments regarding environmental performance that would substantially address many concerns expressed regarding potential impacts	These criteria should be codified into a List of Commitments to guide mine development and operations.
	EDC Section 4.3, Table 4-1		Site-specific WQ standards	These standards are not consistent with (are generally higher than) those reported and used in Appendix 19-C as Project-specific WQ standards. This should be rectified. Also, Aquatic Life standards in Table 4-1 for metals and sulphate are high for waters with very low hardness such as those in the study area. The potential for high toxicity of divalent metals/SO4 in very low hardness waters should be considered when setting standards.
	EDC Section 7.3		“The TSF shall be designed and constructed to prevent discharge to or contamination of surface water and groundwater.”	Is this criterion consistent with the project plan to discharge tailings supernatant to Tempati Creek?

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## **Appendix A2**

### **Overview of the Draft ESIA Air Quality, Noise and Socio- Community, Socio-Economic and Health Studies**

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## **A2 OVERVIEW OF THE DRAFT ESIA AIR QUALITY, NOISE AND SOCIO-COMMUNITY, SOCIO-ECONOMIC AND HEALTH STUDIES**

### ***Air Quality***

The air quality assessment is comprehensive and the approach is standard. The baseline study provides a good background for the industrial zone, but does not provide a good background for any of the settlement areas. In particular the PM<sub>10</sub> 24-hour concentration is predicted to exceed the WHO guideline in areas outside the industrial zone and this potential impact should be monitored. The use of new mining equipment that meets current emission standards is a positive indication that mitigation will be taken seriously.

The Greenhouse gas assessment is basically satisfactory and shows that the impact based on the global mining industry will be minor. However, the percentage increase in Suriname's total annual GHG emissions should be stated to put the scale of the mine's GHG emissions into a regional context. The site remediation program proposed by Surgold, when completed, will offset project GHG emissions although this does not appear to have been discussed in the report.

If mitigation and monitoring are properly followed the project's air quality impact should be kept to an acceptable level.

### ***Noise and Vibration***

Baseline noise monitoring was undertaken at two sites, one located in the industrial zone near the proposed processing plant and the other near the existing exploration camp, i.e., outside the industrial zone. Monitoring at both sites took place for a one-hour period. The baseline noise monitoring effort would have to be described as minimal. It is not clear whether additional noise monitoring data will be collected during the construction phase of the project. The mine site is located approximately 15 km from the nearest community (village). Noise and vibration impacts from mining operations are not a concern at the villages nearest to the mine site.

Project related noise impacts along the access road from Paramaribo to Moengo and onward to the mine site have been assessed. In some areas, the modeled baseline noise levels are above the IFC thresholds. In these cases, incremental project related noise increases should not exceed 3 dBA based on IFC criteria. The fact that the road from Moengo to the mine site area is not paved will likely have an effect on the absolute noise levels generated by traffic, but the incremental noise increase due to mine-related traffic will be determined by the difference between current and future traffic volumes. It will take a 100% increase in traffic volumes to create a 3 dBA increase in traffic noise levels and a traffic increase of this amount is not anticipated.

### ***Socio-Community, Socio-Economic and Health Studies***

The Social Baseline (Volume I) and Social Impact Assessment reports (Volume II) are generally detailed, thorough and competently written. Secondary source statistical information appears accurately reported and widely sourced. Of particular note is the effort devoted to collecting first-hand information from and about the residents of the social study area through site visits, focus group sessions and detailed interviews. These processes took place in a number of communities located within the social study area.

The Draft ESIA document outlines a number of possible social impacts of the Merian mine project and describes measures intended to mitigate these impacts. Surgold will need to continue the consultative process during the construction and operations phases to ensure that the mitigation approaches discussed in the report are working as envisioned and are meeting their intended purposes.

## **Part B: Checklist for the Review of Environmental Assessments**

## CHECKLIST FOR THE REVIEW OF ENVIRONMENTAL ASSESSMENTS : Surgold Merian Gold Project

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
<b>1 DESCRIPTION OF THE PROJECT</b>			
<i>Purpose of the Project &amp; Status of Decision Making</i>			
1.1 Are the purpose(s) and objectives, or rationale for the project explained?	YES	YES	
1.2 Does the report list all environmental approvals that are required for the project to proceed?	YES	YES	
1.3 Has the proponent made a decision to proceed before the results of the EIA are known? Does it indicate their status?	YES	YES	No mining infrastructure yet.
<i>Project Timing</i>			
1.4 Does the report include a projected timeline for the construction phase, the operations phase and the decommissioning phase (if applicable)?	YES	YES	Included in Table 3-2 of the Draft ESIA
<i>Details of Construction, Operations, Decommissioning</i>			

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
1.5 Are the methods of construction described? Is there sufficient detail?	YES	NO	Project design still seems preliminary and much information is lacking or too general.
1.6 Are the nature and methods of production or other types of activity involved in operation of the project described?	YES	NO	Also related to comment 1.5. As the design is still preliminary the nature and methods of other activities. There is very limited information on the use and handling of Cyanide. The methods of production seem to have a good overall description.
<b><i>Physical Characteristics</i></b>			
1.7 Are the design and size of the project described, using diagrams, plans and/or maps, as necessary?	YES	NO	There is missing information on some of the maps. E.g the Treated Water Storage Pound.
1.8 Are the following clearly shown on the scaled map: <ul style="list-style-type: none"> <li>• the land occupied by the project site(s)</li> <li>• access arrangements</li> <li>• auxiliary facilities</li> <li>• Landscaping Areas</li> <li>• the construction site(s), including the camps for housing workers (if required)</li> </ul>	YES	See comments	Most items are clearly shown, but there is some information lacking or not explained in some of the maps

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
1.9 In the linear project, has the following been described: <ul style="list-style-type: none"> <li>• land corridor</li> <li>• vertical and horizontal alignment</li> <li>• a need for tunneling and earthworks</li> </ul>	YES	YES	
1.10 Has the land use for the project site been described and shown on a plan?	YES	YES	
1.11 Has the ownership of the site been described? Are there any competing claims for ownership (including claims by indigenous peoples), and have they been noted?	YES	YES	
1.12 Are any additional services (water, electricity, emergency services etc.) or developments required as a consequence of the project described?	YES	YES	
<b><i>Project inputs</i></b>			
1.13 Are there indications of the nature and the quantities of the materials needed for the construction and operational phases?	YES	NO	not addressed

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
1.14 Is there an estimate(s) of the number of workers and visitors entering the project site during construction and operation?	YES	YES	
1.15 Have the workers' means of access and transport been described?	YES	YES	
1.16 Has the means of transporting materials and products to and from the site during construction and operation been indicated? Has the number of transports been given?	YES	YES	
2 ALTERNATIVES			
2.1 Does the report include references to the consideration of alternatives by the developers?	YES	YES	
2.2 If alternatives are described, are they realistic and genuine alternatives to the proposed project?	YES	NO	Power alternative options need a better description. There are 6 options, but only 4 are discussed of which at least one seems unrealistic in the timeframe to the operations phase of the mine
2.3 Are the environmental factors used to compare alternatives adequately	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
2.4 Is there an adequate comparison of the alternatives, using a clear set of environmental factors?	YES	NO	It is unclear how the score rating was established for some of the factors
<b>DESCRIPTION OF THE EXISTING ENVIRONMENT (BASELINE)</b>			
<i>Study Area</i>			
3.1 Is there a definition of the study area broad enough to include potential significant environmental impacts on areas away from the immediate construction and operation sites.	YES	YES	
3.2 Does the report include maps showing the study areas? Are significant natural and settlement features shown on the map?	YES	See comment	Mostly appropriately addressed but also include the industrial area which is discussed in the Social Study but not included in section 1.4
3.3 Have the land uses of the areas surrounding the site(s) been described?	YES	YES	
<i>Baseline Conditions</i>			
3.4 Have the components of the environment potentially affected by the project been identified and described sufficiently for the prediction of impacts?	YES	NO	There is a shortage of climate and hydrological data which also influenced assessing the environmental impacts on water resources and site water management.

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
3.5 Is there an adequate description of existing atmospheric conditions? (e.g., air quality, climate)	YES	NO	There is a shortage of climate data
3.6 Is there an adequate description of existing geophysical conditions? (e.g., topography, soils & geology, surface water quality & quantity, groundwater quality & quantity)	YES	NO	There is a shortage of hydrological data.
3.7 Is there an adequate description of existing noise conditions?	YES	YES	
3.8 Is there an adequate description of socio-economic conditions? (e.g., land uses, employment, settlement patterns, economic activities, community services, transportation, historic & cultural resources, indigenous communities, etc.)	YES	YES	
3.9 Is there an adequate description of both terrestrial and aquatic biological conditions (species and habitats, communities and populations)?	YES	NO	Some of the information was not clear or needs to be expanded. See NIMOS and expert team comments

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
3.10 Were the methods used to investigate the affected environment appropriate to the size and complexity of the assessment task?	YES	NO	Methods were not always described in detail and as such it is difficult to say if they were appropriate. See NIMOS and expert team comments.
3.11 Does the report consider the likely changes to the baseline that might occur even if the project does not proceed?	NO		
3.12 Have existing technical data sources, including local records and studies carried out for environmental agencies and/or interest groups, been searched?	YES	NO	It is recommended to do this, especially for short-term rainfall data
3.13 Are statements or facts substantiated by data that is adequately referenced?	YES	NO	see comments on water resources
3.14 Have local, regional and national plans and policies been reviewed and other necessary data collected to predict future environmental conditions?	YES	YES	
3.15 Have local, regional and national agencies holding information on baseline environmental conditions been approached?	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
<b>4 DESCRIPTION OF IMPACTS</b>			
<i>Impact Identification: (Note: impacts may be described taking into account mitigation which is part of the basic project design, or mitigation may be identified after significant impacts have been identified)</i>			
4.1 Have the direct and indirect/secondary effects of constructing, operating, and where relevant, after use or decommissioning of the project been considered (including positive and negative effects)?	YES	YES	
4.2 Is there consideration of whether effects will arise as a result of 'consequential' development, i.e. whether additional development, will be induced in the area leading to further environmental effects?	YES	YES	
4.3 Have the potential impacts on atmospheric conditions been investigated? (e.g., air quality, climate)	YES	YES	
4.4 Have the potential impacts on geophysical conditions been investigated? (e.g., topography, soils & geology, surface water quality & quantity, groundwater quality & quantity)	YES	NO	There are some uncertainties regarding the Water Resources Impacts (see Expert Comments)

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
4.5 Have the potential impacts on the noise setting been investigated?	YES	YES	
4.6 Have the potential impacts on socio-economic conditions been investigated? (e.g., land uses, employment, settlement patterns, economic activities, community services, transportation, historic & cultural resources, indigenous communities, etc.)	YES	YES	
4.7 Have the potential impacts on terrestrial and aquatic biological conditions been investigated (species and habitats, communities and populations)?	YES	NO	See expert comments on biological resources impacts
4.8 If any of the above components were not investigated, is there an adequate rationale in the report to justify their exclusion?	YES	YES	
4.9 Is each impact investigated appropriately, relative to its importance for the decision? Does the investigation avoid unnecessary information and concentrate on key issues?	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
4.10 Are impacts, which are not significant independently but may contribute cumulatively to a significant effect, considered?	YES	YES	
4.11 Are impacts on non-renewable resources considered?	NO		
<b>Accidents &amp; Malfunctions</b>			
4.12 Has consideration been given to impacts which may arise from: <ul style="list-style-type: none"> <li>• non-standard operation conditions,</li> </ul> (i.e. equipment failure, or unusual environmental conditions such as flooding) <ul style="list-style-type: none"> <li>• accidents</li> <li>• emergencies</li> </ul>	YES	NO	Water management could be an issue when it comes to flooding and much information on this topic has yet to be specified.  The discussion on Cyanide use is very generic and does not address it to the level that the reader is convinced that the usage at the Surgold site is well understood.
4.13 If the nature of the project is such that accidents are possible which might cause severe damage within the surrounding environment, has an assessment of the probability and likely consequences of such events been carried out and the main findings reported?	YES	NO	Cyanide use and management, especially in case of an accident or prevention are not appropriately addressed.

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
<b><i>Residual Wastes &amp; Emissions</i></b>			
4.14 Have the types and quantities of the following been estimated: <ul style="list-style-type: none"> <li>• waste matter, energy (noise, vibration, light, heat, radiation etc.)</li> <li>• residual materials generated during construction and operation</li> <li>• the rate at which the above will be generated</li> </ul>	YES	YES	
4.15 Are their proposed methods of handling and/or treating these wastes and residual material prior to release/disposal been indicated (including the routes that by which they will eventually be disposed of)?	YES	NO	Waste Management Plan was not included in the Draft ESIA
4.16 Are any special or hazardous wastes that will be produced identified? Is the method of their disposal described, as well as their likely environmental impacts?	YES	NO	Waste Management Plan was not included in the Draft ESIA
<b><i>Methodology</i></b>			

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
4.17 Does the information include a description of the methods/approaches used to identify impacts and the rationale for using them?	YES	YES	
4.18 Are areas of uncertainty appropriately acknowledged?	NO		
5 MITIGATION			
<i>Description of Mitigating Measures</i>			
5.1 Has the mitigation of significant negative impacts been considered, and, where feasible, have specific measures been proposed to address each impact?	YES	NO	Many times there is a reference to the management plans which have not been included in the Draft ESIA
5.2 Are there descriptions of the reasons for choosing a particular type of mitigation, as well as the other options available?	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
5.3 Are the following considered appropriately in the mitigation: <ul style="list-style-type: none"> <li>• modification of project design</li> <li>• construction and operation</li> <li>• replacement of facilities/resources</li> <li>• creation of new resources</li> <li>• "end-of-pipe" technologies for pollution control</li> </ul>	YES	NO	Management plans not included in Draft ESIA
5.4 Are mitigation measures generally recognized methods are are they experimental? Proven techniques are preferred.	YES	NO	Management plans not included in Draft ESIA
5.5 Is it clear to what extent the mitigation methods will be effective?	YES	NO	
5.6 Is the following made clear, and has data been introduced to justify assumptions made: <ul style="list-style-type: none"> <li>• where the effectiveness of procedures, climate conditions etc.</li> <li>• assumptions where there is a risk that mitigation will not work</li> </ul>	YES	NO	Some assumptions were made but there was not data (results) to justify the statement. See Expert comments on water resources
5.7 Have the following been presented: <ul style="list-style-type: none"> <li>• details of how mitigation</li> </ul>	YES	NO	Management plans not included in Draft ESIA

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
implemented <ul style="list-style-type: none"> <li>function over the time span for which they are necessary</li> </ul>			
<b><i>Environmental Effects of Mitigation</i></b>			
5.8 Have any adverse environmental effects of mitigation measures been investigated and described?	YES	see comment	It is difficult to say if it is appropriately addressed as management plans to back te primary minigation are already lacking.
5.9 Has the potential for conflict between the benefits of mitigating measures and their adverse impacts been considered?	YES	see comment	It is difficult to say if it is appropriately addressed as management plans to back te primary minigation are already lacking.
<b>6 MAGNITUDE AND SIGNIFICANCE OF IMPACTS</b>			
<b><i>Magnitude</i></b>			
6.1 Are the impacts described in terms of: <ul style="list-style-type: none"> <li>the nature and magnitude of the change</li> <li>the nature (location, number, value, sensitivity) of the affected receptors.</li> </ul>	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
6.2 Is it clear whether the timescale of the effects predicted are short, medium or long term, temporary or permanent, reversible or irreversible?	YES	YES	
6.3 Where possible, have predicted impacts been expressed in quantitative terms? If not, have quantitative descriptions been defined?	YES	YES	
6.4 If quantitative predictions are provided, is the level of uncertainty of the results described?	YES	NO	The level of uncertainty would also depend on the baseline data gathered.
6.5 Have the methods used to predict the nature, size and scale of the impact been described, and are they appropriate to the importance to each projected impact?	YES	YES	
6.6 Is the data used to estimate the size and scale of the main impacts sufficient for the task? Is it clearly described and have their sources been clearly identified?	YES	NO	There is a level of uncertainty in some of the baseline data, especially water resources.
<b>Significance</b>			

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
6.7 Has the significance of effects been described in terms of extent (ie., the area over which the effects are expected to occur)?	YES	YES	
6.8 Has the significance of effects been described in terms of duration?	YES	YES	
6.9 Has the significance of effects been described in terms of frequency/timing?	YES	YES	
6.10 Has the significance of effects been discussed in terms of ecological importance and societal value (e.g., the impact on the local community and on the protection of environmental resources)?	YES	YES	
6.11 Has the potential reversibility of effects been considered?	YES	YES	
6.12 Has the probability or likelihood of the effect occurring been considered?	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
<p>6.13 Has the significance of effects been discussed taking account of appropriate national and international standards or norms, where these are available? Otherwise have the magnitude, location and duration of the effect been discussed in conjunction with the value, sensitivity and rarity of the resource?</p>	YES	YES	
<p>6.14 Where there are no generally accepted standards of criteria for the evaluation of significance, have alternative approaches been discussed, and if so, is a clear distinction made between fact, assumption and professional judgement?</p>	YES	NO	<p>If there is a distinction between fact ,assumption and professional judgement, it has not been specifically addressed.</p>
<p>6.15 Does the report include clear conclusions on which impacts may be significant and which may not?</p>	YES	YES	
<p>6.16 Where mitigating measures are proposed, has the significance of any impacts remaining after mitigation been described?</p>	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
<b>7 FOLLOW-UP &amp; MONITORING ACTIVITIES</b>			
7.1 Has the reinstatement and afteruse of the site been described?	YES	NO	Post closure has only been described in two lines in section 3.7.4
7.2 If impacts are uncertain, have monitoring arrangements been proposed to check the environmental impacts resulting from the implementation of the project and their conformity with the predictions made?	YES	NO	Monitoring Plan was not a part of the Draft ESIA
7.3 Does the scale of any proposed monitoring arrangements correspond to the potential scale and significance of deviation from expected impacts?	YES	NO	Monitoring Plan was not a part of the Draft ESIA
7.4 Are there clear monitoring requirements to ensure that mitigation measures are implemented and working properly?	YES	NO	Monitoring Plan was not a part of the Draft ESIA
<b>8 CONCLUSIONS</b>			
8.1 Are there clear conclusions on the results of the EA process that are understandable?	YES	see comment	although the conclusions are clear and understandable we feel that it is not the right time to make these conclusions because a lot of information, e.g Management Plans, are still missing in the ESIA

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
8.2 If the results are inconclusive, does the report recommend further study?	YES	NO	study and commitments, especially when it comes to water resources.
8.3 Have gaps in the required date been indicated? Have the means used to deal with	YES	NO	Some gaps were identified by the expert review team
8.4 Have any difficulties in assembling or analysing the data needed to predict impacts been acknowledged and explained?	YES	YES	
9 NON TECHNICAL SUMMARY			
9.1 Does the summary contain: • brief description of the project and the environment undertaken by the developer • a description of any remaining or residual impacts	YES	NO	No description of any remaining or residual impacts
9.2 Have technical terms, lists of data and detailed explanations of scientific reasoning been avoided in the summary?	YES	YES	
9.3 Does the non-technical summary present the main findings of the assessment and cover all main issues raised in the information?	YES	YES	

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
9.4 Does the summary include a brief explanation of the overall approach to the assessment?	YES	NO	
9.5 Does the summary provide an indication of the confidence which can be placed in the results?	YES	NO	
<b>10 GENERAL APPROACH</b>			
<i>Organization of the Information</i>			
10.1 Is the information logically arranged in sections?	YES	YES	
10.2 Is the location of the information identified in an index or table of contents?	YES	YES	
10.3 When information from external sources has been introduced, has a full reference to the source been included?	YES	YES	
<i>Presentation of Information</i>			
10.4 Has information and analysis been offered to support all conclusions drawn?	YES	NO	Some data is not presented. See NIMOS and expert team comments

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
10.5 Has information and analysis been presented so as to be comprehensive to the non-specialist; using maps, tables, and graphical material as appropriate?	YES	NO	Some of the maps need more detailed information
10.6 Are all the important data and results discussed in an integrated fashion within the information?	YES	NO	Some data is not presented. See NIMOS and expert team comments
10.7 Has superfluous information (i.e. information not needed for the decision) been avoided?	YES	YES	
10.8 Has the information been presented in a concise form with a consistent terminology and are there logical links between different sections?	YES	YES	
10.9 Have prominence and emphasis been given to severe adverse impacts, to substantial environmental benefits, and to controversial issues?	YES	YES	
10.10 Is the information objective?	YES	YES	
<b>11 STAKEHOLDER INPUT</b>			
11.1 Has the proponent included a list of persons and groups that were consulted?	YES	YES	But information of the Draft ESIA meetings has still to be included

QUESTION	RELEVANT (Y/N)	APPROPRIATELY ADDRESSED (Y/N)	COMMENT
11.2 Does the report include a description of the process used to consult with stakeholders? Was the process sufficient?	YES	YES	
11.3 Has the proponent included a list of concerns identified by stakeholders, and a response to those concerns?	YES	YES	But information of the Draft ESIA meetings has still to be included
11.4 Does the information identify and address the main concerns of the general public and special interest groups (clubs, societies etc.) who may be affected by the project?	YES	YES	
11.5 If indigenous communities are affected by the project, were they consulted?	YES	YES	
11.6 Does the information take account of the main concerns of the relevant statutory bodies?	YES	YES	But information of the Draft ESIA meetings has still to be included