ANNEXES - CHAPTER 2

Annexe 2-9 Noise and Vibration Impact Assessment - SENES

CBG PRODUCTION EXTENSION PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

NOISE AND VIBRATION IMPACT ASSESSMENT

Prepared for:

Compagnie des bauxites de Guinée (CBG)

Prepared by:

SENES Consultants
AN ARCADIS COMPANY

121 Granton Drive, Suite 12
Richmond Hill, Ontario
L4B 3N4

Prepared by:

Nick Shinbin, P.Eng.
Senior Environmental Engineer

Reviewed by:

Jennifer Kirkaldy, B.A.Sc.
Manager, Atmospheric Sciences

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1.0 INTRODUCTION

1.1 BACKGROUND

CBG (Compagnie des bauxites de Guinée) is a mining company jointly owned by the Government of Guinea and Halco Mining (Alcoa, Rio Tinto Alcan and Dadco). CBG currently mines, rails, processes and ships about 13.5 MTPA of bauxite material at 3% moisture from its operations, which are located in Kamsar and Sangarédi in northwest Guinea, as shown in Figure 2.1. These facilities have been operating since 1973.

CBG is currently considering the extension of its bauxite production of shipped material (referred to as the *Project* in this report) starting with 18.5 MPTA, to a plant capacity of 22.5 MTPA at 3% moisture by January 2017 and a further increase of 5 MTPA to a plant capacity of 27.5 MTPA by 2022.

In support of the planned Project, SENES Consultants (SENES) was retained by EEM to complete a noise and vibration study to assess the potential effects of CBG extension activities on ambient noise and vibration levels. The purpose of this report is to characterize the sources of noise and vibration at both Kamsar and Sangarédi, outline the approach used for predictive propagation modelling, and evaluate the model predicted levels using applicable criteria, standards, objectives or guidelines. The objectives of the noise and vibration assessment are:

1. To discuss background or baseline noise and vibration conditions within the Study Areas where relevant data exists;
2. To identify the principal sources of noise and vibration emissions and complete an emissions inventory for the Project including the expansion of the Kamsar Processing Facility and Sangarédi mining operations;
3. To evaluate the various noise and vibration emissions sources using predictive propagation modelling; and
4. To assess the potential effects of the Project on ambient noise and vibration levels.

1.2 OVERVIEW OF THE REPORT

In addition to this introductory section, this noise and vibration impact assessment includes the following eight sections. Section 2.0 describes the assessment methodology including Project-environment interactions, spatial, temporal and technical boundaries, Project effects criteria, and assessment analytical methods. Section 3.0 discusses the existing noise and vibration environment. Section 4.0 describes the assessment scenarios for each location. Section 5.0 describes the sources of noise and vibration that were identified. Sections 6.0 and 7.0 outline the detailed effects assessment including selection of sensitive receptors, modelling parameters and

assessment results. Section 8.0 outlines conclusions and mitigation measures. Section 9.0 lists the references used in the impact assessment.

1.3 FUNDAMENTALS OF NOISE AND VIBRATION

The following brief descriptions of basic noise and vibration concepts are provided to assist the reader with interpretation of the report content.

1.3.1 Noise

The terms "noise" and "sound" can be used interchangeably since there is no physical difference between them; however, noise is typically defined as "unwanted" or "undesirable" sound. Sound is characterized by small air pressure fluctuations above and below atmospheric pressure, and can be described in terms of the following three variables:

- Amplitude;
- Frequency; and,
- Variation with time.

Amplitude is determined by the extent that sound pressure fluctuates above and below atmospheric pressure and is a measure of the loudness or volume level of the sound. The quietest sound that can be heard by most humans is a sound pressure of approximately 20 micropascals (µPa) (i.e., the threshold of hearing), while the loudest sound can reach up to 20 pascals (Pa). Because of this extreme range of sound pressures, a base 10 logarithmic scale is used to describe the sound pressure level (SPL) expressed in decibels (dB). A decibel is the ratio of the acoustic pressure to a reference pressure of 20 µPa, which as noted above is the threshold of hearing:

$$SPL = 10\log\left(\frac{p^2}{p_{ref}^2}\right)$$

where p is the measured acoustic pressure (Pa), and p_{ref} is the reference pressure (Pa). This results in the threshold of hearing having a sound level of 0 dB. On this scale, a 10 dB change in SPL would be perceived as a doubling (or halving) in the loudness of a sound. Generally, a change in SPL of 3 dB represents a barely perceptible change.

The frequency of sound refers to the rate at which a sound wave oscillates. Frequency is expressed in hertz (Hz), and describes the tone of the sound (e.g., the low rumble of thunder versus a high-pitched whistle from a kettle). The human ear can detect a wide range of

frequencies from approximately 20 Hz to 17,000 Hz. However, the human hearing system does not respond equally to all frequencies of sound. Low frequencies below 250 Hz and high frequencies above 10,000 Hz are less audible than the frequencies in between. As a result, frequency response functions were developed that characterize the way people respond to different frequencies. These functions are referred to as the A-, B- and C-weighted curves, representing the way people respond to sounds of normal, very loud and extremely loud sounds, respectively. Environmental noise generally falls into the "normal" category so that the A-weighted SPL, expressed in A-weighted decibels (dBA), is considered the best representation of the non-linearity of the human ear.

Since environmental noise varies over time, it is common practice to convert time-varying sound level data into a single number, called the *energy equivalent sound level* (L_{eq}). The L_{eq} is a sound level that, if constant over a specified period of time, would contain the same sound energy as sound of varying levels over that same period of time (Cowan, J.P. 1994). The L_{eq} is essentially a time-integrated sound level, which is calculated according to the following equation:

$$L_{eq} = 10\log\left[\frac{1}{T}\int_0^T\left(\frac{p(t)^2}{p_{ref}^2}\right)dt\right]$$

where $p(t)$ is the time-varying sound pressure over duration T, p_{ref} is the reference sound pressure of 20 μPa, and $\int dt$ is the integration over infinitesimal intervals of time, dt.

Sound level criteria are typically presented in terms of an L_{eq} value applicable to a stated duration, typically either 1-hour, 8-hour (night-time), 16-hour (daytime) or 24-hour periods for environmental noise.

1.3.2 Vibration

Ground-borne vibration can be defined as the regular repeated motion of a physical object about a fixed point. It is described in terms of displacement, velocity or acceleration. Displacement is simply the distance that a point moves away from a static position. The velocity represents the instantaneous speed of movement. Acceleration is the rate of change of the speed. Although displacement is easier to understand than velocity or acceleration, it is rarely used for describing ground-borne vibration. Most methods used for measuring ground-borne vibration use either velocity or acceleration. Furthermore, the response of humans, buildings, and equipment to vibration is more accurately described using velocity or acceleration. Since sensitivity to vibration typically corresponds to the amplitude of vibration velocity within the low-frequency range (roughly 4 to 80 Hz), velocity is the preferred measure for evaluating ground-borne

vibration. The most common measure used to quantify vibration amplitude is the peak particle velocity (PPV), defined as the maximum instantaneous peak of the vibratory motion.

Peak particle velocity is typically used to evaluate the potential for building damage and can be used to evaluate human response to vibration. Most perceptible indoor vibration is caused by sources within buildings including movement of individuals and operation of mechanical equipment within the building. Typical outdoor sources of perceptible ground-borne vibration are construction equipment and rail traffic.

2.0 ASSESSMENT METHODOLOGY

Bauxite mining, raw material transportation, processing and product shipping activities associated with the Project have the potential to affect ambient noise and vibration levels. This section describes the noise and vibration impact assessment methodology including project-environment interactions, spatial, temporal and technical boundaries, analytical methods and Project effects criteria.

2.1 PROJECT-ENVIRONMENT INTERACTIONS

The potential project-environment interactions related to noise and vibration are summarized in Table 2-1. These interactions are analyzed in subsequent sections to determine whether they are likely to result in noise and vibration levels that exceed the Project effects criteria (see Section 2.5), resulting in an impact. This table also provides the rationale for the identification of each project-environment interaction.

Please note that the discussion herein focuses on noise and vibration impacts on humans, as noise criteria used in this assessment are based on nuisance effects relating to human exposure.

Table 2-1: Potential Project-Environment Interactions for Noise and Vibration

Environmental Component	Effects Indicator	Project Interaction	Environmental Parameter	Potential for Effect?	Rationale
Noise	Guideline limits for noise	Closest off-site sensitive human receptor locations, which include residences or other sensitive land uses[1]	Noise as a potential pathway to nuisance effects on humans	Yes	Sound levels expected to be audible off-site; receptors nearby
Vibration	Guideline limits for vibration	Closest off-site sensitive human receptor locations, which include residences or other sensitive land uses[1]	Vibration as a potential pathway to nuisance effects on humans / structural effects on sensitive buildings	Yes	Vibration levels expected to be perceptible off-site; receptors nearby

Notes:
[1] Sensitive human receptors and sensitive land uses are described in Section 6.1.

2.2 SPATIAL BOUNDARIES

2.2.1 Project Footprint

The Project Footprint is the most immediate area of the Project that includes the area of direct physical disturbance associated with the construction or operation of the Project. The Project Footprint consists of three main components: the Kamsar Processing Facility, the Sangarédi mine region (including the mine haul roads) and the interconnecting rail network between the mine region and Kamsar. Note that the Sangarédi Project Footprint includes approximately 21 km of the existing rail network, the mine haul roads and CBG offices.

2.2.2 Study Areas

Two (2) study areas have been defined for the purposes of this noise and vibration effects assessment. These are the maximum areas within which Project-related noise and vibration effects can be predicted or measured with a reasonable degree of accuracy and confidence. The Study Areas include the Project Footprint and any adjacent areas where Project-related noise and vibration effects may be reasonably expected to occur. The study areas are as follows:

- The Kamsar study area encompasses a region approximately 3 km by 4 km, including the Port of Kamsar, CBG's Kamsar processing facility and the closest sensitive receptors; and
- The Sangarédi study area encompasses a region approximately 28 km by 35 km, roughly centred on CBG's existing rail loading facility south of the Town of Sangarédi and includes active, formerly active and planned bauxite mining areas.

Both study areas considered in this assessment are illustrated in Figure 2.1 at the end of this chapter.

2.3 TEMPORAL BOUNDARIES

The temporal boundaries for the assessment are defined based on the timing and duration of potential effects from activities associated with the Project. The assessment covers all major Project operating phases, each delineated by the anticipated maximum production rate, which is proposed to increase at various intervals through the life of the Project. The total life of the Project where noise and vibration effects could occur from Project-related activities is expected to be approximately thirteen (13) years, and completed in three (3) production phases. Since the level of activity from each of the Project phases differs, the extent of any related potential effects will also differ. For this reason, potential noise and vibration effects of the Project were assessed for:

- Maximum phase I (18.5 MTPA) operation scenario (2.5 years);

- Maximum phase II (22.5 MTPA) operation scenario (4.5 years); and
- Maximum phase III (27.5 MTPA) operation scenario (6 years).

Additional details on the development of the above scenarios are provided in Section 4.0.

2.4 TECHNICAL BOUNDARIES

The noise and vibration impact assessment is subject to some technical limitations due to a lack of scientific information with which to predict noise and vibration levels. These technical limitations have been considered in the assessment and pertain to the following:

- While source-specific measurement data was provided for many existing sources at the Kamsar processing facility, not all sources were characterized using measurement data. Alternate sources of sound level data were required for several existing and proposed future sources. Sound levels were derived from surrogate manufacturer data assuming similar operating parameters, calculations using rated specifications (i.e., power rating, etc.) of the equipment or were based on measurements from SENES' noise database for similar equipment. Sound levels for proposed sources associated with extension were assumed to be similar to an existing source of the same type, or were established using one of the above methods.

- Specific sound level data for each piece of equipment that will be operating at the Sangarédi mining sites were not available. Sound levels were derived from calculations using rated specifications (i.e., power rating, etc.) of the equipment, or were based on measurements from SENES' database for similar equipment;

- The mining activities in the Sangarédi region differ from a more typical mining operation, in which efforts are focused on extracting material from a limited number of very large deposits (e.g., 1 to 5). Instead, in the Sangarédi region, many small deposits are spread throughout an area of approximately 400 km^2, with over 100 separate villages distributed throughout. As such, the typical approach of modelling a single concentrated mine operation and evaluating the nearest sensitive receptors to the property could not reasonably be applied to this undertaking. A simplified modelling approach was therefore applied in order to evaluate the potential impacts at each village, which involved modelling generic sets of potential equipment groupings and employing an allowable setback distance analysis approach.

- Detailed site-specific blasting information was not available, including the charge mass per delay. As such, instead of estimating vibration and overpressure levels with distance

as is typical practice, an allowable charge mass per delay was instead calculated by distance using the adopted vibration and overpressure limits (see section 2.5.3).

These technical limitations were overcome by using highly conservative estimation techniques and professional judgment.

2.5 PROJECT EFFECTS CRITERIA

Noise and vibration effects are typically assessed in quantitative terms through comparison to noise and vibration regulatory guidelines. Noise and vibration effects criteria are based on nuisance effects that may lead to human health effects, typically associated with sleep disturbance and annoyance. There are currently no local noise or vibration guidelines in Guinea. As funding for the Project is being sought from the International Finance Corporation (IFC), noise and vibration guidelines from this organization have been applied in this assessment and are described in the following sections. Guideline sound levels from the World Health Organization (WHO) have also been reviewed. In instances in which these international guidelines do not provide criteria that is appropriate for all anticipated project activities (e.g., blasting), appropriate criteria have been sought from other jurisdictions.

2.5.1 Steady Sources

2.5.1.1 IFC General EHS Guidelines: Environmental (Noise)

The IFC provides a noise assessment approach in its *Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Environmental* document (IFC, 2007). In addition to recommended sound level limits, the document also outlines preferred approaches to prevent and control noise impacts. The IFC provides sound level criteria for daytime (07:00-22:00) and night-time (22:00-07:00) hours, to which the predicted maximum impact of the proposed undertaking are to be compared. These criteria are summarized in Table 2-2. The IFC references these criteria to the WHO *Guidelines for Community Noise* (WHO, 1999), which are discussed in section 2.5.1.3.

Table 2-2: IFC Noise Level Guidelines

Receptor	One Hour LA_{eq} (dBA)	
	Daytime 07:00-22:00	Night-time (22:00-07:00)
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The IFC guidelines state that sound levels from the activity under assessment should not exceed the sound level limits outlined in Table 2-2 or result in an increase to background sound levels of more than 3 dB at the nearest receptor location.

It should be noted that the guideline limits in Table 2-2 are intended for application to steady noise sources, and not impulse noise sources such as blasting. Impulse noise limits for blasting operations are discussed in section 2.5.3.

2.5.1.2 IFC EHS Guidelines for Mining

In addition to the noise guidelines summarized in section 2.5.1.1 from the *IFC General EHS Guidelines*, the IFC also provides a guideline specifically for mining operations which include additional noise considerations. The *EHS Guidelines for Mining* (IFC, 2007) outlines that the noise should be managed by meeting the sound level limits outlined in the *General EHS Guidelines*, and outlines mining-specific noise control techniques. These include the enclosure of processing plants, installation of sound barriers/sound curtains, use of earthen berms at the property boundaries and planning transportation routes to minimize reversing (and associated reverse alarm noise).

Blasting noise is also discussed in this guideline; however, no airblast overpressure or vibration limits are provided. A list of control measures for noise and vibration associated with blasting are offered, including the practice of mechanical ripping rather than use of explosives and blast design/planning considerations.

2.5.1.3 WHO Guidelines for Community Noise

The WHO *Guidelines for Community Noise* (WHO, 1999) outline a set of noise exposure guidelines that are based on the lowest levels of noise that affect human health (critical health effects). The WHO defines an adverse health effect of noise as any temporary or long-term deterioration in physical, psychological or social functioning that is associated with noise exposure. The guideline values represent the sound pressure levels that affect the most exposed receiver in the listed environment. The relevant WHO guideline values are presented in Table 2-3.

Table 2-3: WHO Guideline Values for Community Noise in Specific Environments

Specific environment	Critical health effect(s)	LAeq [dB]	Time base [hrs]
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Outside bedrooms (night-time)	Sleep disturbance, window open (outdoor values)	45	8
School class rooms and pre-schools (indoors)	Speech intelligibility, disturbance of information extraction, message communication	35	During class
Pre-school bedrooms (indoors)	Sleep disturbance	30	Sleeping-time
School, playground (outdoors)	Annoyance	55	During play

2.5.2 Evaluation and Selection of Steady Source Criteria

The incremental limit from the *IFC General EHS Guidelines* (IFC, 2007) of 3 dB above background is not referenced to a specific source, but is known to be the approximate threshold at which the human hearing mechanism will detect a change in sound level (i.e., a change in sound level of less than 3 dB is considered imperceptible to the human ear) (Cowan, 1994). As such, it appears that the objective of this IFC requirement is to limit noise from a proposed undertaking such that it is imperceptible at the nearest sensitive receptor locations.

In terms of rating environmental impacts, typically incremental increases in sound level that are less than 3 dB are assigned a "marginal" or "no impact" rating, due to the imperceptibility of the change in sound level. However, a difference that represents a just perceptible change in sound level is not typically immediately classified as a "high" impact. An incremental increase in sound level of 5 dB is considered to be clearly noticeable but not intrusive; however, sound levels that exceed this increment may result in annoyance (Bies, 1997). A sound level increase of 10 dB is regarded as a perceived doubling of sound level, and is typically associated with a strong community reaction (Bies, 1997). As such, for the purposes of this assessment, the IFC incremental limit of 3 dB has been adopted as the threshold of a "low" impact, and increases of 5 dB and 10 dB have been classified as "moderate" and "high", respectively. These impact ratings are summarized in Table 2-4.

Table 2-4: Relative Criteria for Assessment of Noise Effects

Increase over background sound level (dB)	Change in subjective loudness	Impact rating
Up to 3 dB	Not perceptible	Marginal to none
3 to 5 dB	Clearly noticeable	Low
5 to 10 dB	Almost twice as loud	Moderate
Greater than 10 dB	More than twice as loud	High

2.5.3 Impulse Sources

Effects from impulse sources such as blasting are compared to separate criteria, which are established on a peak basis (rather than an energy equivalent basis over a long duration), to match the time basis of the event. Noise impacts from blasting are related to the airblast overpressure, and may result in startle response and potential rattling of building components such as windows or walls. Noise from blasting is typically evaluated in terms of peak noise levels measured in linear decibels, or *dBL*.

Blasting will also have the potential to cause ground vibration impacts in the areas surrounding the proposed mine sites. There are two aspects to the evaluation of vibration effects: human annoyance and structural damage. Human perception of vibration occurs at levels that are lower than those required to cause structural damage, and therefore designing limits that protect against annoyance will also address the possibility of structural damage. Vibration impacts are evaluated in terms of peak particle velocity (PPV), measured in *mm/s*.

There are currently no regulations in Guinea that govern allowable noise or vibration levels from blasting activities. As such, a jurisdictional review was completed, and criteria levels from the Australian and New Zealand Environmental Council (ANZEC, 1990) have been adopted. These are summarized in Table 2-5.

Table 2-5: Selected Criteria for Blasting Effects

Blasting effect	Recommended maximum level (95th percentile)[1]	Maximum level
Airblast overpressure	115 dBL	120 dBL
Ground vibration	5 mm/s	10 mm/s
1 – level may be exceeded up to 5% of the total number of blasts over a 12 month period		

2.6 ANALYTICAL METHODS FOR THE ASSESSMENT

Environmental noise and vibration impact assessments require the use of a variety of analytical methods, including the use of computer models, engineering calculations and professional

judgement. The analytical methods applied for this noise and vibration impact assessment are discussed in general terms in the following sections.

2.6.1 General Project Data

Information provided by CBG and EEM were used in the preparation of the noise and vibration models. This information included, but was not limited to, the following:

- Extension project feasibility studies for the Kamsar facility (inclusive of proposed equipment and associated specifications);
- Mining plans for the Sangarédi region;
- GIS data for the Sangarédi region;
- Site plan and infrastructure drawings for the Kamsar facility;
- Process flow diagrams;
- Source measurement data collected by CBG at Kamsar;
- Photographs of the Kamsar facility; and
- Personal communications from EEM and CBG.

2.6.2 Noise (Steady Sources)

The Cadna-A modelling software (DataKustik, 2013) was used to assess the noise impacts from anticipated Project activities. The outdoor noise propagation model is based on *ISO 9613, Part 1: Calculation of the absorption of sound by the atmosphere* (ISO, 1993) and *Part 2: General method of calculation* (ISO, 1996). Using this model, a three-dimensional representation of the project site and surrounding area is created, and noise sources are placed as appropriate according to the existing or planned layout. Noise sources are characterized using representative sound level data derived outside of the model (typically measured, calculated or provided by manufacturers), and are assigned to source locations in the model, as appropriate.

The model executes a calculation of the sound attenuation that occurs between the sources and user-specified points of reception according to the standardized ISO method, resulting in an overall predicted sound level at each receptor location. The model accounts for distance, atmospheric absorption and the effect of the intervening ground surface type(s), as well as any obstructions to noise propagation. Obstructions to noise propagation that may be incorporated into the modelling include buildings, acoustic barriers, earthen berms and natural changes in ground elevation. These are also configured to act as reflecting surfaces, which may result in additional source-receptor paths. The ISO 9613 method has been developed to result in the

prediction of "downwind" sound levels, meaning all receptors are considered downwind of all sources. This results in a conservatively high prediction of sound levels. The predictions are valid for wind speeds between 1 and 5 m/s at 3 to 11 m above the ground.

2.6.3 Noise and Vibration (Impulse Sources)

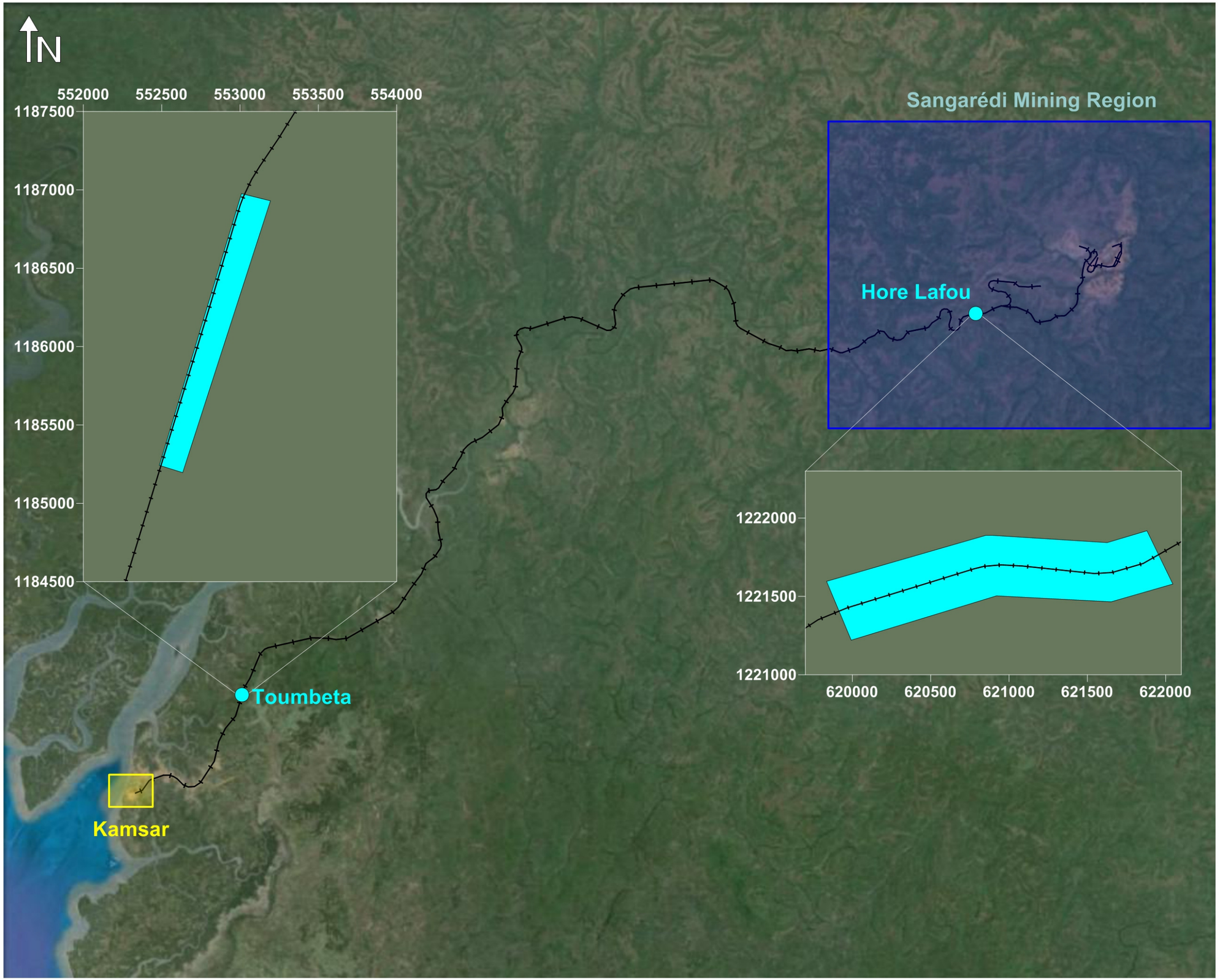
2.6.3.1 Ground Vibration

The propagation characteristics of ground vibration from blasting are influenced by a number of factors, including the geology of the region, the charge mass being detonated and the distance between the blast and receptors. As propagation is strongly dependent upon geology, and geology is very site-specific, there are no standard models for reliable, repeatable predictions of ground vibration from blasting. Empirical propagation equations derived through experimentation are typically applied in the prediction of ground vibration levels by distance. These may either be from published literature, or from test blast studies conducted at the actual site under assessment. When using published literature, care must be taken to select equations that are based on measurement conditions that are as close as possible to the proposed undertaking (i.e., similar material being blasted).

For this analysis, an empirical equation for ground vibration propagation has been adopted based on a literature review. The equation predicts ground vibration at a given distance using the proposed charge mass per delay. As the proposed charge mass per delay for the Project is not known at this time, the equation was rearranged to instead calculate an allowable charge mass by distance to the nearest receptor, using the adopted vibration criteria from Table 2-5. A detailed discussion of the vibration modelling methodology is included in section 6.2.2.1.

2.6.3.2 Noise (Airblast Overpressure)

The assessment of airblast overpressure from blasting is also calculated using empirical equations based on measurement data sets. A similar modelling approach as described for ground vibration in section 2.6.3.1 has been adopted for noise. A detailed discussion of the noise modelling methodology is included in section 6.2.2.1.



LEGEND:

- Kamsar Study Area
- Sangarédi Study Area
- Planned Rail Sidings
- Railways

NOTES:

SCALE:

0 km 10 km 20 km

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

Basemap: Google Earth 2014

SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée (CBG)

Kamsar & Sangarédi Study Areas

Drawn By:	Approved By:	Figure No.:
JF	JLK	2.1
Date: Sept. 2014	Project Number: 350854	

3.0 EXISTING CONDITIONS

3.1 NOISE

3.1.1 Methodology

A baseline noise measurement program was completed in February to May 2014 in an effort to characterize the existing noise environment within the Study Areas (both Kamsar and Sangarédi). Baseline noise monitoring was completed in accordance with the IFC *Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Environmental* (IFC, 2007) requirements. The basic procedure consisted of:

- Selecting representative monitoring locations;
- Continuously measuring sound levels at each identified location over a period of forty-eight (48) hours;
- Validating and correcting the hourly data to remove anomalous events using available meteorological data; and,
- Calculating baseline daytime and night-time L_{eq} sound levels for each location.

3.1.2 Measurement Locations

Aerial photography and recent GIS information were utilized to identify the locations of the nearest sensitive noise receptors to the Kamsar processing facility and the areas proposed for mining in the Sangarédi area. On this basis, a total of five (5) noise monitoring locations were selected around the Kamsar facility, and fifteen (15) were selected throughout the mine area. The monitoring locations are plotted in Figure 3.1 and Figure 3.2 at the end of this chapter.

3.1.3 Instrumentation

Sound level data was collected using Larson Davis SoundExpert™ LxT precision integrating sound level meters, configured to log sound levels on a 15-minute basis (15-min L_{eq}). The Larson Davis LxT sound level meter is an ANSI Type 1 meter and meets the *IEC 61672-1:2002* Class 1 integrating sound level meter requirements (IEC, 2002) as required by the *IFC General EHS Guidelines* (IFC, 2007). The sound level meter and model CAL200 calibrator were calibrated to NIST standards prior to deployment in the field, and the calibration was valid during the full period of monitoring.

The sound level meters were field-calibrated at the beginning and end of measurements to ensure accuracy. The sound level meter microphones were mounted on tripods and were located approximately 1.2 m above grade. The microphones were covered with environmental

enclosures (i.e., wind screens) to reduce wind noise over the microphone and to prevent damage from rain. The enclosures were also equipped with bird spikes to prevent birds from perching on the wind screen and interfering with measurements.

The validation and correction process consisted of evaluating sound level data that was collected outside of acceptable meteorological parameters, and excluding these readings from the data analysis. Acceptable meteorological parameters are summarized in Table 3-1.

Table 3-1: Acceptable Meteorological Parameters

Parameter	Lower Limit	Upper Limit
Temperature[1]	-10°C	39°C
Relative Humidity[1]	25%	90%
Precipitation[2]	No precipitation allowed	
Wind Speed[2]	-	20 km/hr

Notes:
[1] Larson Davis LxT operating parameters (Larson Davis, 2013)
[2] SENES standard practice

Site specific meteorological data was collected as part of the baseline conditions assessment being completed concurrently for the Air Quality Impact Assessment. The meteorological station was configured to monitor a variety of meteorological parameters on a one-minute basis, which included temperature, relative humidity, wind speed and direction, and precipitation. This data was converted to 15-minute averages for wind speed, temperature and relative humidity, and 15-minute totals for precipitation, for comparison to the noise data.

Each logged sound level was tabulated with the meteorological data for the corresponding period, and the sound level was removed from the data set if any of the meteorological parameters were found to be outside of the established acceptable ranges. The remaining data was summarized to describe background conditions at each location.

3.1.4 Measurement Results and Discussion

3.1.4.1 Kamsar

The sound environment in the vicinity of the Kamsar processing facility is influenced by existing material processing operations at the plant, as well as sounds of nature and urban sounds (e.g., traffic, human activity) closer to the city. An acoustic model was prepared to estimate the existing influence of sounds from the Kamsar processing facility on the measured sound levels, such that the existing non-plant background sound levels could be appropriately accounted for in the modelling assessment of predicted future sound levels. The dominant sources of existing noise from the Kamsar facility include the power generation building, the dryers, the rail

unloading/crushing building and rail activity. A summary of the daytime and night-time sound levels in the vicinity of the Kamsar facility, as well as the log-average for the full validated monitoring period are provided in Table 3-2.

Table 3-2: Summary of Sound Level Measurement Data at Kamsar

Monitoring Location	Daytime		Night-time		Log-Average for Monitoring Period	
	L_{eq}	L_{90}	L_{eq}	L_{90}	L_{eq}	L_{90}
NR-1	50.9	45.9	51.7	47.1	51.0	46.1
NR-2	52.8	45.6	47.5	43.7	52.3	45.4
NR-3	60.0	48.3	52.5	47.2	59.3	48.1
NR-4	59.2	55.3	53.4	46.3	58.6	54.6

3.1.4.2 Sangarédi Mine Region

Sound levels throughout the region proposed for mining varied depending on proximity to existing infrastructure and mining /hauling operations. Many of the villages are sparsely populated and located in areas with little or no infrastructure such as roads or industry that typically contribute to background sound levels in residential areas. As such, the background sound environment in these areas is characterized primarily by sounds of nature and limited human activity, and the associated sound levels are much lower than those measured in the more populated and active areas such as Hamdallay.

The background sound levels in the outlying villages were generally in the range of 30 – 40 dBA, which is typical of a rural area. Areas such as Hamdallay are near existing mine operations, are more densely populated and closer to infrastructure such as roads and rail, and so background sound levels are more typical of a populated area (i.e., >50 dBA). A summary of the background monitoring locations are provided in Table 3-3.

Table 3-3: Summary of Sound Level Measurement Data at Mine Sites

Village	Daytime Sound Level (dBA)	Night-time Sound Level (dBA)	Log-Average for Monitoring Period (dBA)
Tiewere	38.2	30.9	35.7
Fassali	36.5	36.5	36.5
Parawol Sitako	40.1	39.6	39.9
Pavari	39.4	38.8	39.1
Hamdallay	53.1	55.1	54.1
Dounsi	36.2	37.1	36.5
Kogon Lingue	48.6	45.0	47.8
Kagnaka	50.4	52.3	50.9
Paragogo	NI	NI	NI
Bandodji	38.6	32.1	36.4
Kourawel	38.0	34.0	36.5
Petoun Bondou Wande	43.9	43.9	43.9
Samayabhe	41.4	39.5	40.9
Hore Lafou	45.5	51.8	47.6
Parawol	NI	NI	NI

NI – no information (data discarded due to unrepresentative meteorological conditions)

3.2 VIBRATION

No information was available to establish baseline vibration levels within the Study Areas. It is expected that existing ground vibration levels due to processing operations at the Kamsar port facility are imperceptible due to the separation distance between the site and nearest receptors (over 800 m to the nearest potential vibration source – the crusher building).

Local ground vibration due to rail traffic may be perceptible within approximately 75 m of the rail line during a train pass-by event; however, peak vibration levels due to rail traffic are not anticipated to increase from baseline levels with the implementation of the Project. Currently only a single train may pass a receptor at a time, and while the total number of train trips will increase with expansion, there will remain a maximum of one train pass-by at a time on the track. As peak vibration levels are associated with pass-by events (and not total daily trips), future vibration levels are anticipated to remain the same as existing conditions along the corridor.

Ground vibration levels from blasting in the Sangarédi region may be perceptible under current conditions depending on the location of the activity and nearest village(s), as well as the blast charge mass size. Ground vibration due to blasting is limited to the duration of the blast event, and so is not indicative of an existing "baseline" condition that has the potential to be compounded by the extension project.

LEGEND:

Noise Monitoring Location

NOTES:

SCALE:

0 m 400 m 800 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

Basemap: Google Earth 2014

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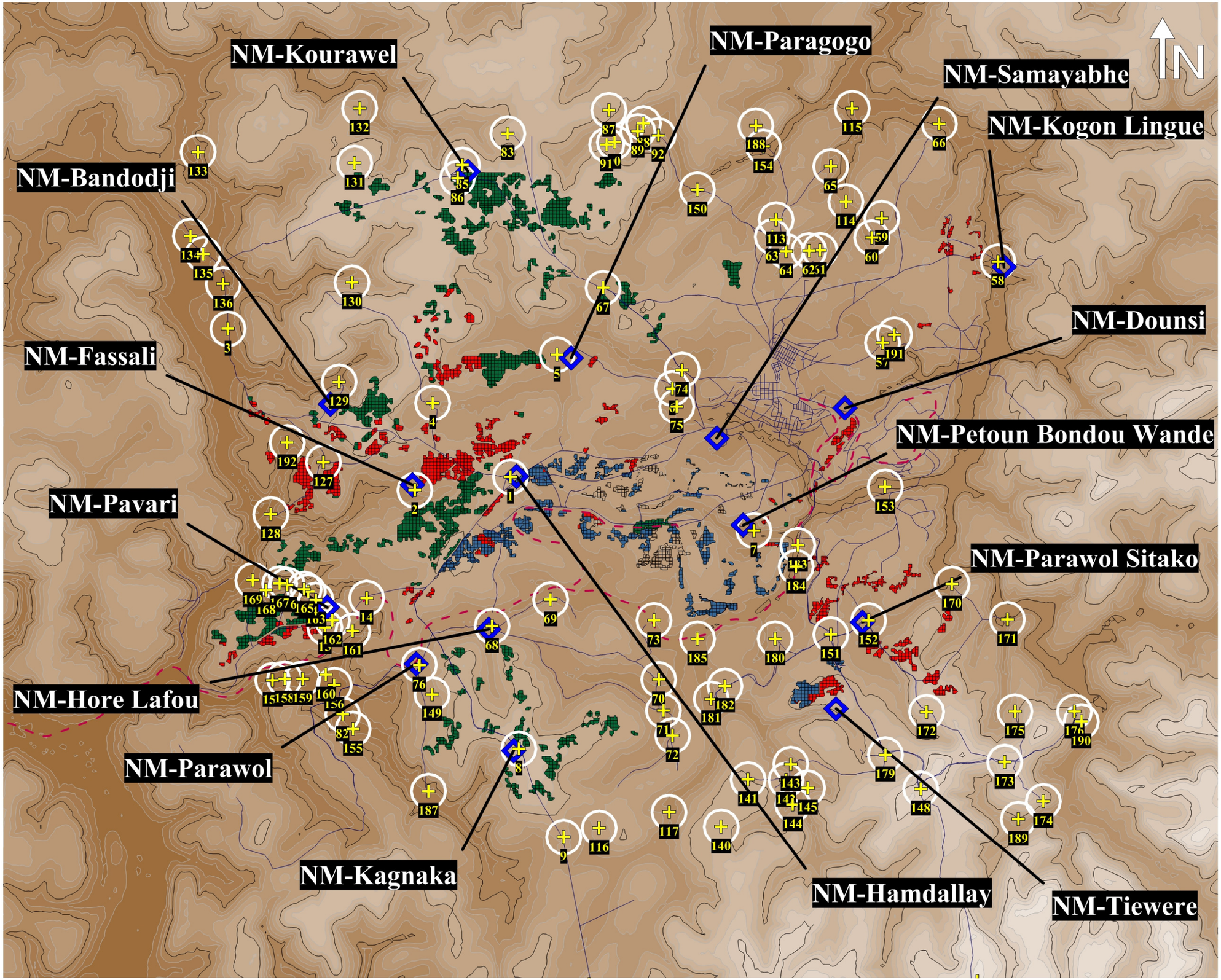
Compagnie des bauxites de Guinée (CBG)

Baseline Noise Monitoring Locations [Kamsar]

Kamsar, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	3.1
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- Monitoring Location
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Baseline Noise Monitoring Locations [Sangarédi Mine Region]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	3.2
Date: Sept. 2014	Project Number: 350854	

4.0 ASSESSMENT SCENARIOS

4.1 KAMSAR MATERIAL PROCESSING FACILITY

As noted in section 2.3, extension of CBG operations is proposed to occur in three (3) phases, each associated with an increase in annual production. As extraction operations in the Sangarédi mine region are increased, capacity at the Kamsar port facility will similarly need to increase to accommodate the additional influx of material. As such, each step up in annual production is accompanied by infrastructure improvements and additions at the Kamsar processing facility. In order to predict the potential impact of these changes on local sound levels, a series of acoustic model runs were completed and compared to baseline conditions. Table 4-1 describes the Kamsar assessment scenarios that were modelled in general terms.

Table 4-1: Kamsar Port Facility Assessment Scenarios

Assessment Scenario	Description
Existing conditions	Model of existing operations at the Kamsar port facility, including: ▪ raw material unloading from rail; ▪ raw material crushing; ▪ transfer of crushed material to stockyard; ▪ material drying (3 lines); ▪ storage of dry product; ▪ ship loading; and ▪ support services (power generation/air compression).
Increase to 18.5 MTPA	Expansion of the existing operation, including: ▪ decommissioning of existing rail unloading/crushing facility; ▪ construction of new rail unloading crushing facility; ▪ addition of new dryer line (Dryer 4); ▪ addition of conveyors and transfer points; ▪ expansion of quay to accommodate additional ship; and ▪ upgrade of support services (power generation/air compression).
Increase to 22.5 MTPA	Expansion of 18.5 MTPA scenario, including: ▪ addition of 2nd crushing line to new unloading facility; and ▪ upgrading various conveyors and transfer points to accommodate additional material throughput; and ▪ upgrade of support services (air compression).
Increase to 27.5 MTPA	Expansion of 22.5 MTPA scenario, including: ▪ addition of new dryer line (Dryer 5); ▪ addition of associated conveyors and transfer points; ▪ addition of new dry storage building; ▪ addition of new transfer tower to feed the ship loading operation; ▪ upgrade of support services (air compression).

4.2 SANGARÉDI MINING OPERATIONS

4.2.1 Blasting

It is expected that raw material at the mine sites will be loosened for extraction via blasting where possible. As per the assessment methodology outlined in section 2.6.3, blasting noise and vibration impacts are assessed on a per-delay basis. At this time, the charge mass per delay is not known, and so meaningful plots of predicted noise and vibration levels with increasing distance could not be generated. Instead, the blasting scenario that was modelled involves determining the allowable charge mass per delay that would result in compliance with the criteria summarized in Table 2-5, which may then be plotted with distance instead. This provides CBG with a tool for blast design in the region, which will be an important consideration given the spatial extent of the project and the various distances to villages.

4.2.2 Mechanical Extraction

The Sangarédi mining region consists of many small deposits spread throughout an area of approximately 400 km^2, with over 100 separate villages distributed throughout at varying distances from the proposed extraction locations. The deposits vary in the grade of material available, and will therefore be drawn from as necessary to achieve the necessary grade of product. Given the spatial extent of the areas proposed for mining throughout the region, the distribution of villages throughout this area and the uncertainty with regard to how much equipment would be deployed to a deposit at a given time, it was not possible to complete a detailed predictive model for each village and mining scenario. Instead, a series of generic models were developed using typical extraction equipment arrangements that may be present at any given mine site when completing mechanical extraction activities. The typical cluster of equipment included:

- Two (2) front-end loaders;
- One (1) bulldozer;
- Two (2) haul trucks at idle (being loaded); and
- Haul trucks in transit to and from the mine site.

Three models were run, assuming *one* cluster, *two* clusters and *three* clusters of equipment would operate simultaneously and adjacent to one another at any given deposit, respectively. The model was configured to calculate sound pressure levels at a series of increasing distances from the centre of the activity, and the results were used to prepare curves depicting sound level with distance. These were considered in conjunction with background sound level data and local terrain effects to arrive at predicted impacts with regard to the IFC criteria and relative impact criteria in Table 2-4. The detailed modelling approach for this assessment scenario is discussed further in section 6.2.2.2.

4.3 PROPOSED RAIL EXPANSION

The assessment of potential effects from increased rail traffic was completed through the analysis of two (2) scenarios:

- Unit segment of rail line with no adjacent rail siding; and
- Unit segment of rail line with an adjacent rail siding.

The first scenario considers only the impact of increasing the rail traffic in the corridor running between Kamsar and Sangarédi. The second scenario accounts for the presence of a rail siding, which in the maximum assessment scenario would have a train passing on the mainline with another train present and idling on the siding. The proposed rail sidings are shown on Figure 2.1.

Sound levels resulting from the existing rail traffic volumes were modelled, and projected increases in rail traffic associated with the three increases in production were assessed in relation to the existing condition. The results were compared to the relative sound increase criteria summarized in Table 2-4.

Note that a vibration scenario was not assessed for the increase in rail activity, as there can only be one train pass-by at a time. As peak vibration levels are associated with individual pass-by events, and not total daily trips, the vibration levels on a PPV basis are anticipated to remain the same as under existing conditions.

5.0 NOISE AND VIBRATION SOURCES

5.1 KAMSAR PROCESSING FACILITY

Noise sources at the Kamsar processing facility were identified using the *Expansion Project FEL2 Study Preliminary Engineering Report* (Fluor, 2014), which provided detailed descriptions of each stage of processing as well as equipment lists and process flow diagrams for each proposed phase of expansion. In general, the operations at the Kamsar facility include:

- Rail unloading, crushing and transfer of material;
- Stockyard and dryer feed conveyors;
- Material drying and associated conveyors;
- Dry storage and ship loading; and
- Support services (power generation, air compression, etc.)

These operations are discussed in the following sections, with a summary of how the associated noise sources were characterized. A full source summary table is provided in Appendix A, and all sound power levels are provided in Appendix B. Note that a vibration assessment was not completed for the Kamsar processing operation, as ground vibration levels due to continuous processing sources are anticipated to be negligible at the nearest sensitive receptors (approximately 800 m from the nearest potential vibration source).

5.1.1 Rail Unloading and Crushing

Raw material from the Sangarédi region mining operation is transported to the Kamsar processing facility via rail. Currently, raw material is unloaded from the rail cars into the crusher building using a hoist that raises the individual rail cars up the side of the crusher building, and tips them into a hopper that feeds the primary crusher units located inside of the building. The primary crusher feeds into the secondary crusher, and the crushed material is conveyed to the stockyard.

The expansion plans involve the construction of a new rail unloading facility, in which rail cars will instead be unloaded at track level by rotating the cars 180°, allowing the material to fall into a primary crusher located underground. The rail cars will be outfitted with rotary couplings for this purpose. This system is proposed for implementation in the 18.5 MTPA expansion scenario, with the operation of a single crushing line. An additional line is proposed for the 22.5 MTPA scenario.

The primary noise sources associated with this phase of the process include:

- existing rail unloading operations;
- existing material crushers (internal);
- future rail unloading operations (rotary car dump);
- future material crushing operations;
- conveyor belts; and
- material drops inside of the transfer towers.

The existing rail unloading and crushing operations were characterized using measurement data collected at the Kamsar site on July 30th, 2014. Interior sound level measurements were collected at the rail unloading drop point (where the rail cars are tipped into the hopper for the primary crusher), and in the general grinding building interior, exposed to noise from the crushers. The application of interior sound levels in the acoustic modelling is discussed in section 6.2.1.4.

The sound levels associated with future rail unloading and crushing equipment were estimated using a variety of techniques. The rotary car dump, material drops to the conveyors, primary/secondary crusher and screen plant sound levels were characterized using data for similar sources from SENES' in-house database of sound level measurement data. The sound levels for the conveyors and crusher apron feeders were estimated using engineering calculation techniques (Miller, 1981) based on the equipment specifications from the FEL2 study report (Fluor, 2014).

5.1.2 Stockyard – Material Conveyance

Under both existing and proposed future operations, crushed material is transferred to the stockyard via a series of conveyor belts and transfer towers. Wet material is stored in outdoor storage piles before being fed to the drying process. Material reclaim units are positioned between each stockpile to transfer stored wet material to the conveyors that feed the drying process. The primary noise sources in this phase of the process include:

- conveyor belts;
- material drops inside of the transfer towers; and
- material reclaim units.

Noise from the conveyor belts and reclaim units were characterized using specifications for the existing drive motors, referenced from the FEL2 study report (Fluor, 2014). The power ratings of the equipment were applied in the estimation of octave band sound power levels using engineering calculations (Miller, 1981). The material drops were characterized using data for a similar source from SENES' in-house database of sound level measurement data.

5.1.3 Material Drying and Associated Conveyance

There are currently three (3) rotary drum dryers at the facility. Air is heated and blown into the rotary dryers as wet material is fed through. The dryers are rotated via a gear drive motor. Exhaust air from the three dryers are directed up a common stack. Future plans include the installation of two more drying lines (Dryer 4 in the 18.5 MTPA scenario and Dryer 5 in the 27.5 MTPA scenario), which will share a common stack. Noise sources that were identified for the drying process include:

- conveyor belts;
- material drops inside of the transfer towers;
- rotary dryers;
- rotary dryer gear drive motor;
- dryer building interior (air heaters, dilution air fans):
- draft fans (to dryer stacks); and
- dryer stack exhausts.

Noise from the conveyor belts and rotary dryer gear drive motor were characterized using specifications for the existing and future drive motors, referenced from the FEL2 study (Fluor, 2014). The material drops were characterized using data for a similar source from SENES' in-house database of sound level measurement data. The rotary dryers, draft fans and existing dryer building interior were characterized using source-specific measurement data collected on July 30th, 2014. Sound levels for the dryer stack exhausts were estimated using surrogate manufacturer sound level data for the fans with similar specifications to the existing and proposed models.

5.1.4 Dry Storage and Shiploading

Dried material is transferred either to the dry storage building, or directly to the port for loading of the docked ship(s). The noise sources associated with this phase of the process include:

- conveyor belts;
- material drops inside of the transfer towers; and
- material reclaim units (inside of the dry storage building).

These are the same sources as described in section 5.1.2, and were characterized in the same manner.

5.1.5 Support Services

There are a number of supporting facilities at the Kamsar site, including two (2) power generation facilities, air compressors, administrative buildings, and maintenance operations. For the purposes of the noise assessment, the following support operations have been included in the modelling:

- Diesel power generation facilities (x2); and
- Air compressor buildings.

5.2 SANGARÉDI AREA MINING OPERATIONS

As described in section 4.2.2, the mining operations were assessed as clusters of typical equipment applied in the mechanical extraction of raw material from the deposits. These included front-end loaders, bulldozers, empty haul trucks at idle (being loaded) and loaded haul trucks in transit to and from the work area. As the extent of equipment that would be deployed to any given site was not known, a series of runs were completed assuming one, two and three clusters of equipment would be operating adjacent to one another. The sound levels for the construction equipment (loaders and bulldozers) were based on calculated estimates of the sound power level based on the power rating of the engine (Beranek, 2006). The engine power ratings were based on equipment models that are currently in use by CBG at Sangarédi. The sound levels for the haul trucks were based on data for similar sources from SENES' in-house database of source measurements.

5.3 BLASTING AND RAIL ACTIVITY

Blasting activity was assessed as a source of both noise and vibration, and rail activity between was assessed as a source of noise only. While vibration may be perceptible within approximately 75 m of the rail line during a pass-by, there can only be one train pass-by at a time under existing and future conditions. As such, there is not anticipated to be an increase in vibration levels on a PPV basis due to the Project, and so no vibration impacts would be predicted.

6.0 PREDICTIVE MODELLING

The following sections describe the detailed predictive propagation modelling approaches that were applied in the assessment of noise and vibration effects.

6.1 DETERMINATION OF SENSITIVE RECEPTORS

Noise and vibration sensitive receptors are typically considered to include:

- residential buildings (i.e., houses, apartments, condominiums);
- institutional buildings, including:
  - places of worship;
  - educational facilities; and
  - hospitals/health care facilities;
- noise sensitive commercial buildings (i.e., hotels/motels).

6.1.1 Kamsar Processing Facility

Sensitive receptors in the vicinity of the Kamsar processing facility were established during the planning of the baseline noise measurement program outlined in section 3.1.2. Aerial photography and recent GIS information were reviewed and four (4) locations representing the nearest sensitive receptors were identified. While no sensitive receptors were apparent within the study area to the south of the Kamsar facility, a fifth baseline monitoring station was included in this direction for completeness. However, as an actual sensitive receptor is not identified in this area, a point of reception has not been modelled in this direction. The location of the points of reception included in the modelling of the Kamsar processing facility are depicted in the contour plots in Appendix D, and are summarized in Table 6-1.

Table 6-1: Kamsar Sensitive Points of Reception

Model ID	Nearest Monitoring Station ID	Direction from Facility	Receptor Description	UTM Coordinates	
				Easting (m)	Northing (m)
POR1	NR-1	N	House	542855	1178357
POR2	NR-2	NE	House	543611	1178141
POR3	NR-3	N	House	543069	1177867
POR4	NR-4	NE	House	544371	1178448

6.1.2 Sangarédi Mining Region

6.1.2.1 Blasting

Specific points of reception were not evaluated in the assessment of blasting impacts, as the exact locations of blasting are not established at this time. In lieu of assessing impacts at actual points of reception, the evaluation was completed by plotting the allowable charge mass per delay against distance, out to a distance of 10 km for both ground vibration and airblast overpressure. These will be used by CBG to effectively plan each blast event such that the limits will be met at each village, as noted in mitigation measures outlined in section 8.2.2.1.

6.1.2.2 Mechanical Extraction

Sensitive receptors in the Sangarédi area were primarily based on GIS information. Shape files were provided by CBG that identified the village locations, along with all of the areas proposed for mining, as well as other infrastructure such as roads, rail and existing mining operations. The village locations provided in these files were incorporated into the modelling assessment for the mechanical extraction operations discussed in section 4.2.2. The villages included in the assessment are shown on Figure 3.2. The villages are numbered, and the identifiers may be cross-referenced to the full list of the village names and population information in Appendix C.

6.1.3 Rail Activity

Due to the length of the rail line and the fact that operations will be relatively consistent along the length of the corridor, noise levels due to rail activity have been assessed on a separation distance basis rather than at specific points of reception.

6.2 DETAILED MODELLING METHODOLOGY

6.2.1 Kamsar Processing Facility

The following sections provide an overview of how the modelling was set up for the Kamsar processing facility. The model was developed based on existing operations, and new or altered infrastructure and sources were added to represent the future extension scenarios.

6.2.1.1 Model Configuration

As noted in section 2.6.2, the acoustical modelling of the Kamsar processing facility was conducted using the Cadna-A computer software program (DataKustik, 2013). The outdoor noise propagation model is based on ISO 9613, *Part 1: Calculation of the absorption of sound by the atmosphere* (ISO, 1993) and *Part 2: General method of calculation* (ISO, 1996). The noise

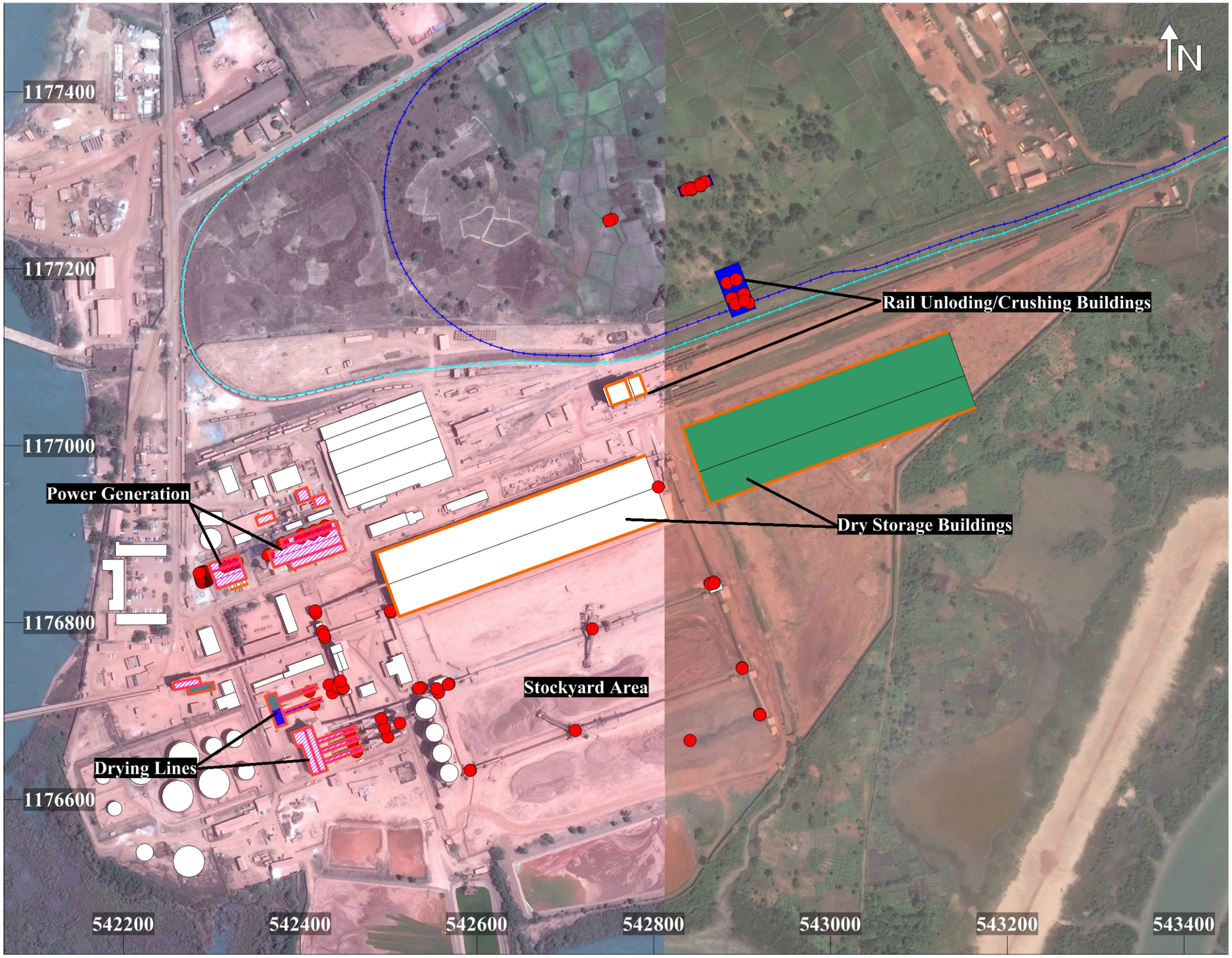
from the Kamsar operation was modelled based on a maximum operating scenario, as described in section 4.1. The following key considerations were incorporated in the modelling:

- an order of reflection of 3 was applied to all on-site noise sources meaning that the model would identify source-receptor paths with as many as 3 reflections (i.e., off of building walls, barriers);
- all buildings and barriers were assumed to be structured facades with a reflection loss of 2 dB;
- the site and surrounding area were assumed to be flat;
- global ground absorption was set to 1 (i.e., absorptive) as the off-site lands are primarily vegetated;
- local ground absorption areas were set to 0 (i.e., reflective) as appropriate at the site; and
- receptors were modelled at a height of 1.5 above grade.

6.2.1.2 Source Characterization

Each source at the site is characterized individually in the acoustic model by selecting the appropriate source type (point, horizontal area, vertical area) and assigning a source-specific sound level. The methodology used to characterize the sound level of each source has been described in section 5.1. The full inventory of sources is provided in Appendix A, and all sound power levels applied in the assessment are included in Appendix B. Refer to Figure 6.1 for a general site and source layout.

Sources associated with the rail line were accounted for using a module within the Cadna-A software platform, which implements sound modelling parameters from the United States Federal Railroad Administration (FRA, 2005). This module allows for sound levels associated with various types of rail vehicles to be assessed either in isolation, or included in a model of industrial sources. Under this methodology, the rail line geometry is plotted in the model, and the types of rail vehicles that utilize the rail line are identified and assigned to the source. The FTA module includes sound level data for many different types of rail vehicles, including standard freight locomotives and freight cars such as those that utilize the CBG rail corridor. Information on the number of locomotives and cars per train, trains per assessment period (i.e., day and/or night) and speed of travel are then input as appropriate. The sound levels attributable to rail traffic are included in the calculation of receptor sound levels. At Kamsar, the rail line was separated into several segments such that the various characteristics of typical travel at the site could be characterized (i.e., train slowing to enter unloading area, slowly progressing through the unloading process, and speeding up to depart the site). Refer to Figure 6.2 for a screenshot from the Cadna-A model depicting the sources, including the rail line.



LEGEND:

- Point source
- Vertical area source
- Building source
- Existing building
- New building (18.5 MTPA)
- New building (27.5 MTPA)
- Existing rail line
- Future rail line

NOTES:

SCALE:

0 m 100 m 200 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

Basemap: Bing Maps 2014

SENES Consultants
AN ARCADIS COMPANY

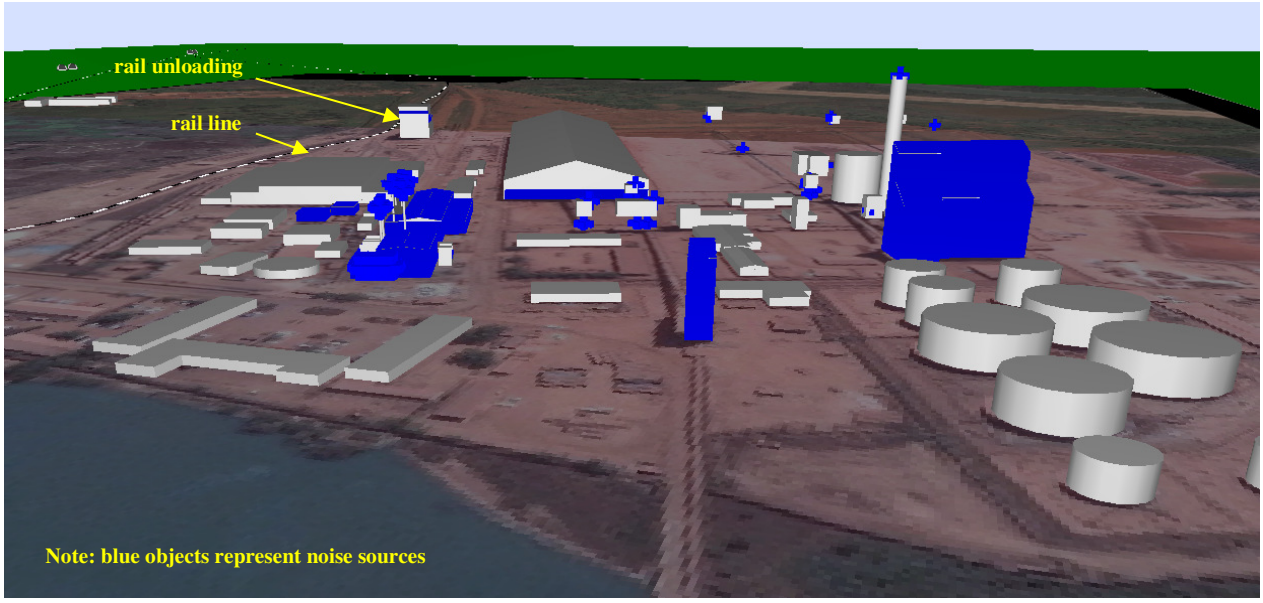
Compagnie des bauxites de Guinée (CBG)

Kamsar Site Layout

Kamsar, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	6.1
Date: Sept. 2014	Project Number: 350854	

Figure 6.2: Cadna-A Model Screenshot (Kamsar)



6.2.1.3 Point Source Directivity

There are several point sources at the Kamsar site for which effects of directivity have been accounted for. These include sources for which there is an expectation that the sound propagation from that source will be focused in a certain direction. An example of this would be the dryer exhaust stacks – the strong air flow from the stack causes the sound to be directed upwards rather than omni-directionally. This has been accounted for by applying directivity corrections from literature, and specifying the direction of propagation in the model.

6.2.1.4 Buildings and Building Sources

There are several sources at the facility that will be located within buildings; however, sound from interior sources has the potential to be audible outside of the building envelope due to openings in the building or transmission of sound through the building materials. In order to account for the outdoor noise propagation from the noise sources operating within the various buildings on-site, area sources representing the building façades were included in the acoustic modelling. The interior sound levels were either measured at the site, or calculated using a function within Cadna-A that calculates an interior sound level based on the sound power levels of all of the equipment operating within a building, as well as the size and absorptive qualities of the interior surfaces. The resulting sound pressure levels were applied as indoor levels to the area sources representing the building façade, and the estimated transmission loss of the building was applied. For openings in the building walls, the transmission loss was set to 0. For

transmission of sound through the building materials, the transmission losses of the building facades were estimated from literature (Miller, 1981), based on 1/8" aluminum siding.

6.2.1.5 Object Controls

Each of the three future extension scenarios were assessed within the same modelling file. As new infrastructure is being added in each scenario, and existing infrastructure is being decommissioned or upgraded, each object (i.e., source, building) needed to be configured to be activated or deactivated depending on the run being executed. This was achieved by establishing a number of categories in the model that each object was then assigned to as appropriate, as summarized in Table 6-2. The scenarios were configured such that, when a given scenario was selected for calculation, only those objects in the associated source group would activate and the rest would remain inactive. If an object was being upgraded, then a duplicate source was created and the two were separated into the appropriate groups. For example, conveyor C2 is being upgraded in the 22.5 MTPA scenario, and remaining as-is until then. A duplicate source was therefore created. The original source with the existing sound level was applied to the 'Existing + 18.5 MTPA' group and the duplicate source with the new sound level was assigned to the '22.5 MTPA to end' source group. As such only one of these would ever be active at a time.

Table 6-2: Kamsar Acoustic Model – Object Groups

Control	Scenario			
	Existing	18.5 MTPA	22.5 MTPA	27.5 MTPA
Existing only	●			
Existing + 18.5 MTPA	●	●		
Existing + 18.5 + 22.5 MTPA	●	●	●	
Existing to end	●	●	●	●
18.5 MTPA only		●		
18.5 + 22.5 MTPA only		●	●	
18.5 MTPA to end		●	●	●
22.5 MTPA only			●	
22.5 MTPA to end			●	●
27.5 MTPA				●

6.2.1.6 Model Validation

In order to confirm that the model was predicting accurately, the results of the model run prepared for existing operations at the Kamsar processing facility were compared to the baseline measurement data collected around the facility. The baseline measurement data includes not only the impact of the Kamsar facility, but also other sources of steady background noise (e.g., traffic, sounds of nature) and was therefore expected to exceed the modelled sound levels.

However, as the plant is expected to be the dominant noise source at locations in the immediate vicinity of the plant, the excess was expected to be minimal.

In order to ensure that the impact of the rail line around the Kamsar facility was accounted for, the model validation was completed on a 24-hour basis using the valid L_{90} measurement data from the baseline monitoring program. The L_{90} was used to minimize excessive influence from other background sources. The modelled sound output from the Kamsar site was assumed to be steady (with the exception of the rail line), and a 24-hr L_{eq} was calculated at each monitoring location.

The predicted sound levels at NR-1, NR-2 and NR-3 are each within approximately 2 dBA of the measured background, which is considered a good correlation as it is within the margin of error of the calculation method. The difference at NR-4 is slightly higher; however, this location is the furthest from the facility and closer to the city of Kamsar, which would be expected to have a higher contribution from non-plant background noise sources associated with the urban centre.

Table 6-3: Model Validation for Kamsar

Measurement Location	Measured Background (L_{90}, dBA)	Predicted Plant Noise (L_{eq}, dBA)	Difference (dBA)
NR-1	46.1	43.9	2.2
NR-2	45.4	44.8	0.6
NR-3	48.1	47.3	0.8
NR-4	54.6	50.4	4.2

6.2.2 Sangarédi Mining Region

6.2.2.1 Blasting

Analysis of ground borne vibration propagation from blasting typically relies on the use of a scaling factor that relates the size of the charge being detonated in a single delay (usually 8 ms) to the distance at which a vibration level is measured (or predicted). For ground vibration, the square-root scaled distance (SRSD) is typically applied, which is calculated using the charge mass per delay (W, kg) and the distance from the blast to the receptor (D, m) per equation [1].

$$\textit{Square-root scaled distance } (SRSD) = \frac{D}{\sqrt{W}} \qquad [1]$$

Empirical equations are derived by plotting the measured vibration level (PPV, mm/s) against the applicable SRSD, and fitting a trend-line to the data. The line-of-best-fit for ground vibration typically follows a power-law relationship, per equation [2].

$$\textit{Vibration (PPV, mm/s)} = K(SRSD)^n \qquad [2]$$

The coefficients *K* and *n* for the power law relationship are the constants associated with the line-of-best-fit, and variability in these values is typically a function of geology.

In lieu of site-specific measurement data, a literature review was completed to establish a set of coefficients for use in this analysis. Resources included an Ontario Ministry of the Environment guideline (MOE, 1985), research conducted by the U.S. Bureau of Mines (USBM, 1980), previous SENES project experience, and various journal articles and publications. The average *n* value from the literature review was found to be -1.63, and so this value was considered reasonable for application in this assessment. Values of *K* ranged from 192 to 1729. A 90th percentile value of *K*=1373 was applied in this assessment.

$$\textit{Vibration (PPV, mm/s)} = 1373\left(\frac{D}{\sqrt{W}}\right)^{-1.63}$$

As with the assessment of ground vibration, the empirical equations describing airblast overpressure propagation utilize a scaled distance, though using the cube root of the charge mass per delay, rather than the square root. This is called the cube-root scaled distance (CRSC), per equation [3].

$$\textit{Cube-root scaled distance } (CRSD) = \frac{D}{\sqrt[3]{W}} \qquad [3]$$

A plot of airblast overpressure measurements (in lbs/in^2, which can be converted to dBL) versus the *CRSD* typically trend such that the line-of-best-fit to the data follows a power law relationship, similar to that for ground vibration:

$$\textit{Airblast overpressure (lbs/in}^2\textit{)} = K(CRSD)^n \qquad [4]$$

As with ground vibration, the coefficients *K* and *n* are site specific and are established based on the actual measurement data; however, for this analysis they have been based on a literature review. The USBM has summarized data for collected at a "metal mine", which have been adopted for this assessment (USBM, 1980). The *K* value was 0.401, and the *n* value was -0.713 for this calculation. Note that the use of these constants as published by the USBM require the

use of imperial units of distance (ft) and charge mass (lbs). The resulting overpressure in lbs/in^2 is then converted to decibels based on a reference pressure of 2.9x10^{-9} lbs/in^2.

$$\textit{Airblast overpressure (AB) (lbs/in}^2\textit{)} = 0.401\left(\frac{D}{\sqrt[3]{W}}\right)^{-0.713}$$

$$\textit{Airblast overpressure (dBL)} = 20\log_{10}\left(\frac{AB}{2.9\times10^{-9}}\right)$$

6.2.2.2 Mechanical Extraction

The Cadna-A model was also applied to predict sound levels from future operations at the proposed mine sites. Given the spatial extent of the areas proposed for mining throughout the region, the distribution of over 100 villages throughout this area and the uncertainty with regard to how much equipment would be deployed to a deposit at a given time, it was not possible to complete a detailed predictive model for each village and mining scenario. Instead, a series of generic models were developed using typical equipment arrangements that may be present at any given mine site when completing mechanical extraction activities. The typical cluster of equipment included:

- Two (2) front-end loaders;
- One (1) bulldozer;
- Two (2) haul trucks at idle (being loaded); and
- Haul trucks in transit to and from the mine site.

Three Cadna-A models were set up and run assuming *one* cluster, *two* clusters and *three* clusters of equipment would operate simultaneously and adjacent to one another in any given area, respectively. The model was configured to calculate sound pressure levels at a series of increasing distances from the centre of the activity, and the results were used to prepare curves depicting sound level with distance. A line-of-best-fit was plotted for each scenario, which followed a logarithmic trend of the form $y = c\ln(x) + b$ (where b and c are constants, and ln is the natural logarithm). The constants associated with each line were exported for use in a calculation spreadsheet developed for the estimation of sound levels at each village.

Prior to proceeding with detailed calculations of the predicted sound level at each village, a separate Cadna-A model was developed, in which each village location was plotted in the Cadna-A model with a digital terrain model of the surrounding area. The mine plan was imported to the model, a marker was placed at the closest proposed working area to each village, and the source-receptor distance was calculated based on the coordinates. The 3D viewing

capability of the model was then used to determine whether there was a clear line of sight to the working area, or whether the terrain in the vicinity of the receptor formed a natural barrier. Each village was then identified as having either a clear or blocked line of sight. The sound levels in the propagation curves were adjusted down by 5 dB for villages with a blocked line of sight. The calculations were completed for 102 villages in the vicinity of proposed mining operations.

Each village was assigned a background sound level, based on the background monitoring program data. As a simplifying assumption, the data from the nearest background monitoring location to each village was assumed to describe background conditions at the village under assessment. The sound level propagation curves and village-to-mine distances were then used to calculate the approximate sound level attributable to the nearest mining activity at each village. This predicted sound level was then added logarithmically to the assigned background sound level at each village to arrive at a total projected future sound level at each location. These total sound levels were compared to the IFC absolute limits (55 dBA daytime and 45 dBA night-time), and difference between the future level and the baseline level was compared to the IFC relative limit of 3 dB.

6.2.3 Rail Activity

The assessment of potential effects from increased rail traffic was completed by developing two (2) scenarios for modelling in Cadna-A, each representing unit segments of rail line identical in geometry to that developed for the baseline model. The first scenario was representative of a typical section of rail with no adjacent siding. The second scenario was representative of the locations where a new rail siding is proposed, and may therefore have a train passing on the mainline with a train idling on the siding.

The sources representing the mainline were configured with rail traffic volumes that represent the expected traffic based on the future expansion scenarios. The results from each scenario were compared to those for the existing condition to determine the effect of the increase in rail traffic. For the runs that included a siding, measurement data for an idling locomotive from SENES' in-house measurement database were applied. The sound levels were estimated on an hourly basis, as well as on daytime (15-hr), night-time (9-hr) and daily (24-hour) bases.

7.0 EFFECTS ASSESSMENT

7.1 KAMSAR PROCESSING FACILITY

The model of existing conditions at the Kamsar plant was used as the basis to develop models of proposed future operations with the expansion infrastructure in place. For each future scenario, additional sources and buildings were added to the model as appropriate to describe the scenario, and set to toggle on or off depending on the scenario being run.

The sound output from the facility was assumed to be relatively steady, and so separate daytime and night-time operating scenarios were not evaluated. The predicted sound levels for each scenario are summarized in Table 7-1 (18.5 MTPA), Table 7-2 (22.5 MTPA) and Table 7-3 (27.5 MTPA). The predicted future total sound levels remain at or below the IFC daytime criteria level of 55 dBA for each scenario, and the maximum increment of 3 dB required by the IFC is not exceeded for any future scenario. The predicted future sound levels exceed the IFC night-time criteria of 45 dBA at each location; however, the baseline sound level also exceeded 45 dBA at these locations. The modelling analysis indicates that the expansion of the Kamsar facility is not predicted to result in noise impacts per IFC guidance.

Table 7-1:Summary of Predicted Noise Impacts for the 18.5 MTPA Extension

Receptor	Non-Plant Background (dBA)	Existing		18.5 MTPA		Increment
		Predicted Plant Sound Level (dBA)	Total Sound Level (dBA)	Predicted Plant Sound Level (dBA)	Total Sound Level (dBA)	
POR1	42	44	46	46	47	1
POR2	37	45	46	47	47	1
POR3	40	47	48	49	49	1
POR4	53	50	55	51	55	<1

Table 7-2: Summary of Predicted Noise Impacts for the 22.5 MTPA Extension

Receptor	Non-Plant Background (dBA)	Existing		22.5 MTPA		Increment
		Predicted Plant Sound Level (dBA)	Total Sound Level (dBA)	Predicted Plant Sound Level (dBA)	Total Sound Level (dBA)	
POR1	42	44	46	46	48	2
POR2	37	45	46	47	47	1
POR3	40	47	48	50	50	2
POR4	53	50	55	52	55	<1

Table 7-3: Summary of Predicted Noise Impacts for the 27.5 MTPA Extension

Receptor	Non-Plant Background (dBA)	Existing		27.5 MTPA		Increment
		Predicted Plant Sound Level (dBA)	Total Sound Level (dBA)	Predicted Plant Sound Level (dBA)	Total Sound Level (dBA)	
POR1	42	44	46	47	48	2
POR2	37	45	46	48	48	2
POR3	40	47	48	50	51	3
POR4	53	50	55	52	55	<1

In addition to calculating the sound levels at the nearest points of reception, the model was also configured to calculate sound levels over a 10 m x 10 m grid covering the model extents in order to provide sound level contour plots. The sound level contour plots for each scenario are provided in Appendix D. These plots clearly illustrate the effect of the new infrastructure on sound propagation. For example, when the plots for the existing scenario and the 18.5 MTPA scenario are compared, the impact of the new rail unloading area being added to the north-east of the main site is clearly visible. The contours around this area get wider with the introduction of the second raw material processing line in the 22.5 MTPA scenario. It should be noted that these plots only depict sound propagation from the Kamsar processing facility, and do not include background sound (i.e., the sound levels read from the contours do not represent total sound levels).

7.2 SANGARÉDI MINING REGION

7.2.1 Blasting

The assessment of ground vibration and airblast overpressure requires the distance to receptors and the charge mass per delay. The charge mass per delay had not been established at the time of this assessment, so an assessment of the predicted levels with increasing distance could not be calculated. As such, the propagation equations were instead solved for the charge mass per delay (W) at a number of distances, using the criteria from Table 2-5 as the predicted level. When plotted, the resulting curve can be used to establish the maximum charge mass per delay that may be used at any given distance to comply with the limits. These plots are provided in Figure 7.1 and Figure 7.2.

Figure 7.1: Maximum Allowable Charge Mass per Delay by Distance (Ground Vibration)

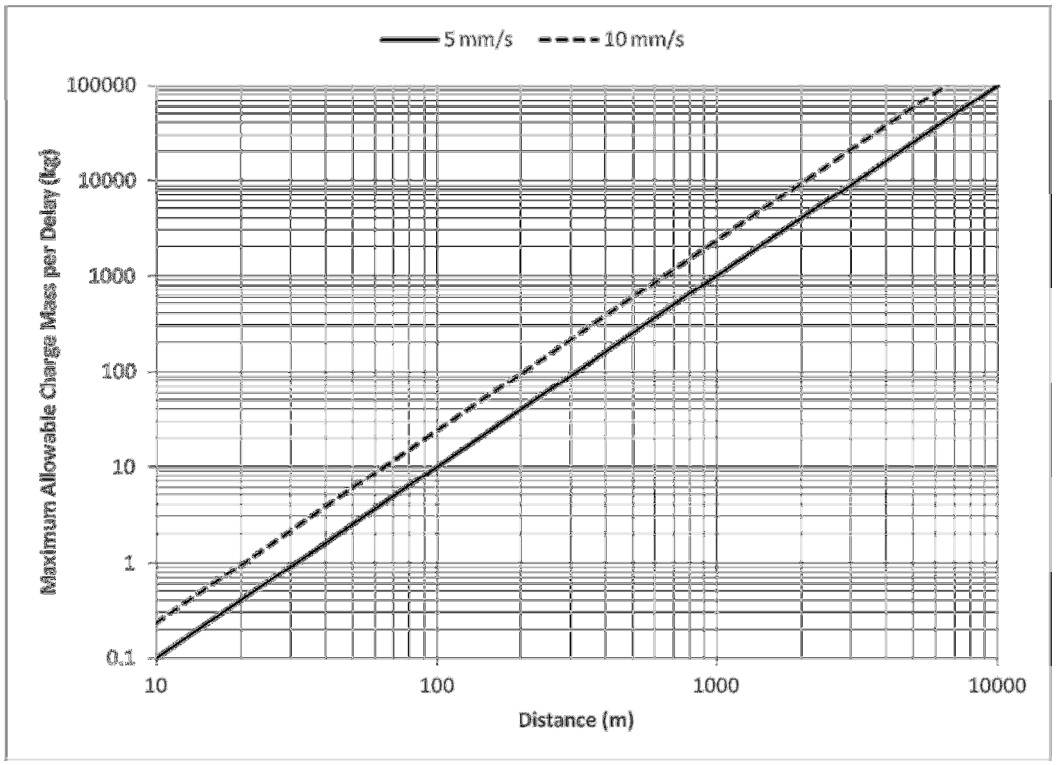
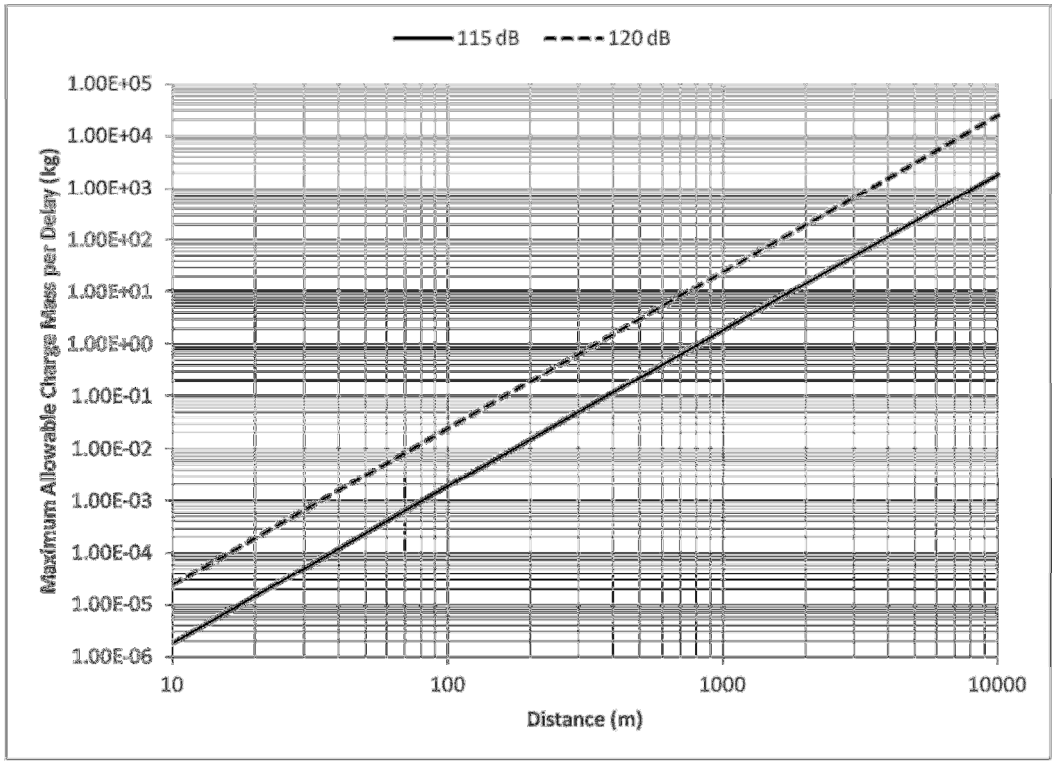


Figure 7.2: Maximum Allowable Charge Mass per Delay by Distance (Airblast)



CBG will use the information in these plots to limit the charge mass per delay at any given location to achieve both the ground vibration and airblast overpressure limits.

7.2.2 Mechanical Extraction

As described in section 6.2.2.2, sound levels attributable solely to mining activity were calculated at a total of 102 villages, based on various activity levels at the nearest proposed work areas. These predictions were added logarithmically to the baseline sound levels from the baseline monitoring program, to arrive at total future sound levels. The future sound levels were compared to the baseline condition to determine the increment, which was compared to the IFC criteria of 3 dB and the impact ratings in Table 2-4. The future sound levels were also compared to the absolute IFC criteria in Table 2-2. Exceedances of the absolute and/or relative criteria were predicted at a number of villages, as summarized in Table 7-4.

Table 7-4: Number of Villages Predicted to Exceed IFC Criteria for Nearest Work Area

Scenario	Daytime (07:00-22:00)		Night-time (22:00-07:00)	
	No. of Villages Exceeding Absolute Limit (55 dBA)	No. of Villages Exceeding Relative Limit (<3 dB)	No. of Villages Exceeding Absolute Limit (45 dBA)	No. of Villages Exceeding Relative Limit (<3 dB)
1 working area	40	39	63	43
2 working areas	48	48	74	54
3 working areas	53	53	87	67
Note: total number of villages modelled was 102				

In order to present the results, the setback distance that would be required for the prediction results to comply with the IFC criteria (both absolute and relative) at each village was calculated. The calculated setback distances for daytime and night-time hours have been plotted as a radius around the associated village in Appendix E. Work at any of the proposed mining areas that appear within the displayed setback radius are predicted to result in an exceedance of IFC criteria at the associated village.

As noted in the discussion of criteria, strict adherence to the IFC incremental limit of no more than a 3 dB increase over background means that the project activities will not be perceptible at the receptor location. Impact ratings for sound level increments that exceed 3 dB were provided in Table 2-4. As noted in that table, an increment of up to 5 dB is considered to have a "low" rating, and an increment up to 10 dB is considered to have a "moderate" rating. Additional calculations were completed to determine the setback distances required to limit increments above background to 3 dB ("low" impact), 5 dB ("moderate" impact) and 10 dB ("high" impact). These plots are provided in Appendix F for each of the three scenarios. As with the IFC plots,

work at any of the proposed mining areas that appear within the setback radius presented are predicted to result in an incremental increase greater than the presented amount. For example, if a mine working area appears inside of a 5 dB setback radius for a given village, it means that village will experience a sound level increase of greater than 5 dB (or a "moderate" impact) if work is completed in that area. The number of villages with a predicted "moderate" impact are summarized in Table 7-5. The detailed calculation results are provided in Appendix G.

Table 7-5: Number of Villages with Moderate Impact (>5 dB increment)

Scenario	Daytime (07:00-22:00)	Night-time (22:00-07:00)
1 working area	30	33
2 working areas	36	42
3 working areas	42	45
Note: total number of villages modelled was 102		

7.3 RAIL ACTIVITY

As noted in section 6.2.3, the potential noise impact of rail traffic increases was based on an acoustic model of existing rail conditions, with source adjustments to reflect the future increases. The increases in sound level were attributable to additional daily train trips, additional locomotives and freight cars per train (where applicable), and the addition of rail sidings with idling engines. The assumptions are outlined in Table 7-6. The predicted increases in sound level due to projected increases in rail traffic are summarized in Table 7-7.

Table 7-6: Summary of Rail Traffic Modelling Assumptions

Production scenario	Daily trips	No. of locomotives per train	No. of cars per train
Existing	5.0	2	120
18.5 MTPA	5.7	3	120
22.5 MTPA	6.9	3	120
27.5 MTPA	8.1	3	126

Table 7-7:Summary of Predicted Incremental Increases in Rail Traffic Noise

Production Scenario	Increment Increase (Day, 15hr L_{eq}, dBA)		Incremental Increase (Night, 9hr L_{eq})		Incremental Increase (24hr Leq, dBA)		Incremental Increase (1-hr)	
	Mainline Only	Mainline + Siding	Mainline Only	Mainline + Siding	Mainline Only	Mainline + Siding	Mainline Only	Mainline + Siding
18.5 MTPA	1.7	2.0	0.5	0.5	1.2	1.4	0.5	0.6
22.5 MTPA	1.7	2.1	2.2	2.2	1.9	2.1	0.5	0.6
27.5 MTPA	2.8	3.2	2.4	2.4	2.6	2.8	0.6	0.8

The incremental sound levels on a one-hour basis are not as high as the day/night/24-hr levels since there will only be one train pass-by per hour along the mainline for all operating scenarios. As such, for these runs the incremental differences in sound level per future operating scenario are the result of increases in the number of locomotives and freight cars required for future production rather than increases in train trips over the course of a given day.

All predicted increments are less than 5 dB, and so the increase in rail traffic due to the proposed expansion of operations is assigned a "low" or "marginal" impact rating per Table 2-4, and mitigation has therefore not been considered.

8.0 CONCLUSIONS

8.1 KEY CONCLUSIONS

The following points summarize the main observations and conclusions of the noise and vibration impact assessment:

- Future sound levels from the Kamsar processing facility are predicted to comply with IFC noise criteria for each proposed stage of production. No mitigation measures have been assessed for the Kamsar facility.

- There is potential for blasting impacts depending on the charge mass per delay and the distance to the nearest sensitive receptors. The charge mass per delay will be set in accordance with the analysis in this report such that vibration and noise limits are met.

- Proposed mining operations in the Sangarédi region are predicted to result in exceedances of the IFC criteria at several villages, depending on the scenario. Setback distances required to meet the IFC criteria and the relative impact criteria outlined in Table 2-4 have been calculated, and will be consulted by CBG for planning mining operations.

- The increase in production is not predicted to result in noise impacts due to increased rail traffic. No mitigation measures have been assessed for this operation.

- Peak vibration levels associated with rail traffic are not anticipated to change from existing conditions. While daily rail traffic will increase, peak vibration levels are associated with individual pass-by events and there will remain only a single train pass-by at a time at any given receptor.

8.2 MITIGATION MEASURES

8.2.1 Kamsar

The predicted sound levels at the closest sensitive points of reception to the Kamsar processing facility comply with the strict requirements of the IFC guidelines outlined in Table 2-2, and result in noise impact ratings of "marginal to none" per Table 2-4. As such, an assessment of noise mitigation was not found to be necessary for the expansion of the Kamsar processing facility.

8.2.2 Sangarédi Mining Region

8.2.2.1 Blasting

Blasting has the potential to cause an adverse noise and/or ground vibration impact, depending on the charge mass per delay and distance to the nearest receptor. The following mitigation measures will be taken to control blasting noise and vibration:

- CBG will limit the charge mass per delay based on the actual source-receptor distance, in accordance with Figure 7.1 and Figure 7.2; and
- CBG will complete a feasibility study for the use of surface mining techniques when the required charge mass per delay cannot be accommodated;
- CBG will notify nearest residents of blasting schedule.

As outlined in section 8.3.2.1, it is further recommended that blasting noise and vibration monitoring be conducted to develop site-specific propagation curves for consideration in blast design and planning.

8.2.2.2 Mechanical Extraction

The evaluation of the mining activities at the proposed mine sites indicated that a number of villages would be adversely impacted when equipment was operating at certain locations. The following mitigation measures will be taken to control noise from mining operations:

- The required setback distance plots will be consulted to determine the maximum amount of equipment that can be deployed to a given mining location in a given time period (day and night). If the mining location is within the 5 dB setback radius of a village for all equipment scenarios, then mining will not take place at this location.
- Similar to the above, if it is found that mining can take place at a given location during one time period, but not another (e.g., the mine location is outside of the 5 dB setback radius during the daytime hours but not the night-time hours), this operating restriction will be adhered to;
- CBG will evaluate the feasibility of purchasing equipment with "low noise" options for new equipment, where such options are available;
- CBG will ensure that all mobile equipment is in good repair and properly maintained;
- CBG will ensure that all mobile equipment is outfitted with effective muffling devices that are in good working order;
- CBG will evaluate the feasibility / availability of white-noise reverse alarms for mobile equipment;
- Where applicable, material stockpiles will be located between the mining activity and the nearest village(s);

- CBG will evaluate options for haul routes that maximize the distance to community areas;
- CBG will regularly maintain all haul roads such that they are free of potholes or other major surface irregularities that may result in excess noise from passing haul trucks; and
- CBG will develop a noise complaints protocol to record and respond to complaints from the community.

8.2.3 Rail Activity

The noise effects from increased rail activity are predicted to result in impacts that are either "marginal to none" or "low". As such, an assessment of noise mitigation was not found to be necessary for the increased rail activity.

8.3 MONITORING MEASURES

8.3.1 Kamsar Processing Facility

As the modelling of the future operating scenarios at the Kamsar facility were largely based on sound level calculations for generic equipment and other assumptions (i.e., that new equipment will be similar to existing equipment for similar processes), it is recommended that a follow-up monitoring program be conducted for each phase of expansion. This program would be similar in scope to the baseline monitoring program that was conducted in support of this study (i.e., 48-hours of continuous monitoring at the selected locations around the Kamsar facility). This monitoring data can be used to validate the modelling predictions and ensure that the evaluation criteria is being met.

8.3.2 Sangarédi Mining Region

8.3.2.1 Blasting

The propagation equations used to predict noise and vibration levels from blasting have been referenced from literature, and are very specific to the geologies of the sites they were developed for. As such, there is uncertainty in how accurate these predictions are for this particular site. Given that this could have implications for the allowable charge mass per delay, it is recommended that blast monitoring be conducted such that site specific propagation equations can be developed for use in blast design for the extension project.

8.3.2.2 Mechanical Extraction

The assessment of mining activities was completed using predictive modelling based on generic equipment groupings. As such, follow-up monitoring is recommended to confirm the results of the assessment. This program would be similar in scope to the baseline monitoring program that was conducted in support of this study (i.e., 48-hours of continuous monitoring at the closest village to mining activity). This monitoring data can be used to validate the modelling predictions and ensure that the evaluation criteria is being met.

8.3.3 Rail Activity

No follow-up monitoring is proposed for the rail line.

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ANNEX A

KAMSAR NOISE SOURCE SUMMARY TABLE

Table A-1: Kamsar Noise Source Summary Table

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
Point Sources									
CBL301	Screen 1 (18.5 MTPA+)		•	•	•	93.4	--	542842	1177292
CBL302	Screen 2 (22.5 MTPA+)			•	•	93.4	--	542852	1177296
CBR301	Rail Unloading - Rotary Car Dumper 1 (18.5 MTPA+)		•	•	•	122.2	MD_Ore	542892	1177160
CBR302	Rail Unloading - Rotary Car Dumper 2 (22.5 MTPA+)			•	•	122.2	MD_Ore	542903	1177164
CHG301	Rail Unloading - Rail Car Positioner (18.5 MTPA+)		•	•	•	107.6	CHG301	542908	1177162
CNC301	Primary Sizer 1 (18.5 MTPA+)		•	•	•	120.5	PC	542883	1177184
CNC302	Primary Sizer 2 (22.5 MTPA+)			•	•	120.5	PC	542893	1177188
CNC302	Secondary Sizer 1 (18.5 MTPA+)		•	•	•	120.9	SC	542837	1177290
CNC304	Secondary Sizer 2 (22.5 MTPA+)			•	•	120.9	SC	542858	1177298
CVY001_M	Conveyor C1 Motor (Existing)	•				107.6	CVY001	542863	1176844
CVY002_MEx	Conveyor C2 Motor (Existing | 18.5 MTPA)	•	•			104.0	CVY002	542900	1176749
CVY002_MUp	Conveyor C2 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	106.3	CVY002_U	542900	1176749
CVY003_MEx	Conveyor C3 Motor (Existing | 18.5 MTPA)	•	•			107.6	CVY003	542592	1176633
CVY003_MUp	Conveyor C3 Motor (22.5 MTPA | 27.5 MTPA) - Update			•	•	107.6	CVY003_U	542592	1176633
CVY004_MEx	Conveyor C4 Motor (Existing | 18.5 MTPA)	•	•			107.6	CVY004	542568	1176731
CVY004_MUp	Conveyor C4 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	107.6	CVY004_U	542568	1176731
CVY005_MEx	Conveyor C5 Motor (Existing | 18.5 MTPA)	•	•			104.1	CVY005	542557	1176721
CVY005_MUp	Conveyor C5 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	105.6	CVY005_U	542557	1176721
CVY006_MEx	Conveyor C6 Motor (Existing | 18.5 MTPA)	•	•			103.2	CVY006	542537	1176727
CVY006_MUp	Conveyor C6 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	103.8	CVY006_U	542537	1176727
CVY009_MEx	Conveyor C9 Motor (Existing)	•				104.9	CVY009	542428	1176784
CVY009_MUp	Conveyor C9 Motor (18.5 MTPA+) - Upgrade		•	•	•	107.1	CVY009_U	542428	1176784
CVY010_MEx	Conveyor C10 Motor (Existing)	•				103.2	CVY010	542418	1176811
CVY010_MUp	Conveyor C10 Motor (18.5 MTPA+) - Upgrade		•	•	•	105.1	CVY010_U	542418	1176811
CVY016_MEx	Conveyor C16 Motor (Existing | 18.5 MTPA)	•	•			107.6	CVY016	542502	1176812
CVY016_MUp	Conveyor C16 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	107.6	CVY016_U	542502	1176812
CVY017_M	Conveyor T1 Motor (Existing+)	•	•	•	•	107.6	CVY017	540645	1176411
CVY018_MEx	Conveyor T2 Motor (Existing)	•				107.6	CVY018	540588	1176249
CVY018_MUp	Conveyor T2 Motor (18.5 MTPA+)		•	•	•	110.6	CVY018_U	540588	1176249
CVY019_M	Conveyor T3 Motor (Existing+)	•	•	•	•	110.6	CVY018_U	540543	1176265
CVY020_MEx	Conveyor C20 Motor (Existing | 18.5 MTPA)	•	•			104.0	CVY020	542920	1176696
CVY020_MUp	Conveyor C20 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	106.3	CVY020_U	542920	1176696
CVY030_MEx	Conveyor C30 Motor (Existing | 18.5 MTPA)	•	•			105.8	CVY030	542841	1176667
CVY030_MUp	Conveyor C30 Motor (22.5 MTPA | 27.5 MTPA) - Upgrade			•	•	107.6	CVY030_U	542841	1176667
CVY301_M	Conveyor C301 Motor (18.5 MTPA+)		•	•	•	107.6	CVY301	542843	1177290
CVY302_M	Conveyor C302 Motor (22.5 MTPA+)			•	•	107.6	CVY301	542853	1177294
CVY303_M	Conveyor C303 Motor (18.5 MTPA+)		•	•	•	106.3	CVY303	542753	1177256

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
CVY304_M	Conveyor C304 Motor (18.5 MTPA+)		•	•	•	107.6	CVY304	542868	1176846
CVY306_M	Conveyor C306 Motor (18.5 MTPA+)		•	•	•	104.6	CVY306	542448	1176726
CVY307_M	Conveyor C307 Motor (27.5 MTPA)				•	104.6	CVY307	542445	1176734
CVY317_M	Conveyor T10 Motor (27.5 MTPA)				•	107.6	CVY017	540653	1176412
CVY318_M	Conveyor T20 Motor (27.5 MTPA)				•	107.6	CVY318	540572	1176151
CVY319_M	Conveyor T30 Motor (27.5 MTPA)				•	110.6	CVY018_U	540514	1176169
DG2_HDR01	Diesel Centrale 2 - Heat Dump Radiator 01 (Existing+)	•	•	•	•	81.0	HDR	542295	1176848
DG2_HDR02	Diesel Centrale 2 - Heat Dump Radiator 02 (Existing+)	•	•	•	•	81.0	HDR	542294	1176847
DG2_HDR03	Diesel Centrale 2 - Heat Dump Radiator 03 (Existing+)	•	•	•	•	81.0	HDR	542293	1176847
DG2_HDR04	Diesel Centrale 2 - Heat Dump Radiator 04 (Existing+)	•	•	•	•	81.0	HDR	542292	1176846
DG2_HDR05	Diesel Centrale 2 - Heat Dump Radiator 05 (Existing+)	•	•	•	•	81.0	HDR	542290	1176846
DG2_HDR06	Diesel Centrale 2 - Heat Dump Radiator 06 (Existing+)	•	•	•	•	81.0	HDR	542289	1176845
DG2_HDR07	Diesel Centrale 2 - Heat Dump Radiator 07 (Existing+)	•	•	•	•	81.0	HDR	542295	1176849
DG2_HDR08	Diesel Centrale 2 - Heat Dump Radiator 08 (Existing+)	•	•	•	•	81.0	HDR	542294	1176849
DG2_HDR09	Diesel Centrale 2 - Heat Dump Radiator 09 (Existing+)	•	•	•	•	81.0	HDR	542292	1176848
DG2_HDR10	Diesel Centrale 2 - Heat Dump Radiator 10 (Existing+)	•	•	•	•	81.0	HDR	542291	1176848
DG2_HDR11	Diesel Centrale 2 - Heat Dump Radiator 11 (Existing+)	•	•	•	•	81.0	HDR	542290	1176848
DG2_HDR12	Diesel Centrale 2 - Heat Dump Radiator 12 (Existing+)	•	•	•	•	81.0	HDR	542288	1176847
DG2_HDR13	Diesel Centrale 2 - Heat Dump Radiator 13 (Existing+)	•	•	•	•	81.0	HDR	542294	1176851
DG2_HDR14	Diesel Centrale 2 - Heat Dump Radiator 14 (Existing+)	•	•	•	•	81.0	HDR	542293	1176851
DG2_HDR15	Diesel Centrale 2 - Heat Dump Radiator 15 (Existing+)	•	•	•	•	81.0	HDR	542291	1176850
DG2_HDR16	Diesel Centrale 2 - Heat Dump Radiator 16 (Existing+)	•	•	•	•	81.0	HDR	542290	1176850
DG2_HDR17	Diesel Centrale 2 - Heat Dump Radiator 17 (Existing+)	•	•	•	•	81.0	HDR	542289	1176850
DG2_HDR18	Diesel Centrale 2 - Heat Dump Radiator 18 (Existing+)	•	•	•	•	81.0	HDR	542288	1176849
DG2_HDR19	Diesel Centrale 2 - Heat Dump Radiator 19 (Existing+)	•	•	•	•	81.0	HDR	542293	1176853
DG2_HDR20	Diesel Centrale 2 - Heat Dump Radiator 20 (Existing+)	•	•	•	•	81.0	HDR	542292	1176853
DG2_HDR21	Diesel Centrale 2 - Heat Dump Radiator 21 (Existing+)	•	•	•	•	81.0	HDR	542291	1176852
DG2_HDR22	Diesel Centrale 2 - Heat Dump Radiator 22 (Existing+)	•	•	•	•	81.0	HDR	542289	1176852
DG2_HDR23	Diesel Centrale 2 - Heat Dump Radiator 23 (Existing+)	•	•	•	•	81.0	HDR	542288	1176851
DG2_HDR24	Diesel Centrale 2 - Heat Dump Radiator 24 (Existing+)	•	•	•	•	81.0	HDR	542287	1176851
DG2_HDR25	Diesel Centrale 2 - Heat Dump Radiator 25 (Existing+)	•	•	•	•	81.0	HDR	542293	1176855
DG2_HDR26	Diesel Centrale 2 - Heat Dump Radiator 26 (Existing+)	•	•	•	•	81.0	HDR	542292	1176855
DG2_HDR27	Diesel Centrale 2 - Heat Dump Radiator 27 (Existing+)	•	•	•	•	81.0	HDR	542290	1176855
DG2_HDR28	Diesel Centrale 2 - Heat Dump Radiator 28 (Existing+)	•	•	•	•	81.0	HDR	542289	1176854
DG2_HDR29	Diesel Centrale 2 - Heat Dump Radiator 29 (Existing+)	•	•	•	•	81.0	HDR	542288	1176854
DG2_HDR30	Diesel Centrale 2 - Heat Dump Radiator 30 (Existing+)	•	•	•	•	81.0	HDR	542286	1176853
DG2_HDR31	Diesel Centrale 2 - Heat Dump Radiator 31 (Existing+)	•	•	•	•	81.0	HDR	542292	1176858
DG2_HDR32	Diesel Centrale 2 - Heat Dump Radiator 32 (Existing+)	•	•	•	•	81.0	HDR	542290	1176858
DG2_HDR33	Diesel Centrale 2 - Heat Dump Radiator 33 (Existing+)	•	•	•	•	81.0	HDR	542289	1176857

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
DG2_HDR34	Diesel Centrale 2 - Heat Dump Radiator 34 (Existing+)	•	•	•	•	81.0	HDR	542288	1176857
DG2_HDR35	Diesel Centrale 2 - Heat Dump Radiator 35 (Existing+)	•	•	•	•	81.0	HDR	542287	1176856
DG2_HDR36	Diesel Centrale 2 - Heat Dump Radiator 36 (Existing+)	•	•	•	•	81.0	HDR	542285	1176856
DryerExh_New	Dryer Stack (18.5 MTPA | 22.5 MTPA) - New Stack		•	•		109.1	Dryer_Fan	542442	1176728
DryerExh_NewU	Dryer Stack (27.5 MTPA) - New Stack Update				•	112.1	Dryer_Fan (x2)	542442	1176728
EXT301	Rail Unloading - Apron Feeder 1 Motor (18.5 MTPA+)		•	•	•	107.6	EXT301_U	542890	1177167
EXT302	Rail Unloading - Apron Feeder 2 Motor (22.5MTPA+)			•	•	107.6	EXT301_U	542901	1177171
FOR001	Dryer 1 - Rotary Gear Drive Motor (Existing+)	•	•	•	•	107.6	FOR001	542464	1176654
FOR001_Fan	Dryer 1 - Draft Fan Motor (Existing+)	•	•	•	•	107.0	D1_EDF	542499	1176670
FOR001-3_Exh	Dryer Stack (Existing+)	•	•	•	•	113.8	Dryer_Fan (x3)	542513	1176686
FOR002	Dryer 2 - Rotary Gear Drive Motor (Existing+)	•	•	•	•	107.6	FOR001	542459	1176665
FOR002_Fan	Dryer 2 - Draft Fan Motor (Existing+)	•	•	•	•	109.4	D2_EDF	542495	1176681
FOR003	Dryer 3 - Rotary Gear Drive Motor (Existing+)	•	•	•	•	107.6	FOR001	542456	1176676
FOR003_Fan	Dryer 3 - Draft Fan Motor (Existing+)	•	•	•	•	111.1	D3_EDF	542492	1176692
FOR004	Dryer 4 - Rotary Gear Drive Motor (18.5 MTPA+)		•	•	•	107.6	FOR001	542416	1176707
FOR004_Fan	Dryer 4 - Draft Fan Motor (18.5 MTPA+)		•	•	•	111.1	D3_EDF	542436	1176720
FOR005	Dryer 5 - Rotary Gear Drive Motor (27.5 MTPA)				•	107.6	FOR001	542410	1176722
FOR005_Fan	Dryer 5 - Draft Fan Motor (27.5 MTPA)				•	111.1	D3_EDF	542433	1176730
GEN001_Exh	Diesel Centrale 1 - Generator 1 Stack (Existing)	•				112.5	GenOld_Exh	542400	1176895
GEN002_Exh	Diesel Centrale 1 - Generator 2 Stack (Existing)	•				112.5	GenOld_Exh	542402	1176900
GEN003_Exh	Diesel Centrale 1 - Generator 3 Stack (Existing)	•				112.5	GenOld_Exh	542414	1176900
GEN004_Exh	Diesel Centrale 1 - Generator 4 Stack (Existing)	•				112.5	GenOld_Exh	542416	1176904
GEN005_Exh	Diesel Centrale 1 - Generator 5 Stack (Existing)	•				112.5	GenOld_Exh	542426	1176904
GEN006_Exh	Diesel Centrale 1 - Generator 6 Stack (Existing)	•				112.5	GenOld_Exh	542428	1176909
Gen10_Exh	Diesel Centrale 1 - Generator 10 Stack Exhaust (Existing+)	•	•	•	•	112.3	Gen10_Exh	542364	1176877
Gen1112Exh_Ex	Diesel Centrale 2 - Generator 11/12 Stack Exhaust (Existing)	•				115.6	GenNew_Exh	542329	1176868
Gen1112Exh_U	Diesel Centrale 2 - Generator 11/12 Stack Exhaust (18.5 MTPA+)		•	•	•	118.6	GenNew_Exh (x2)	542329	1176868
Gen1314Exh_Ex	Diesel Centrale 2 - Generator 13/14 Stack Exhaust (Existing)	•				115.6	GenNew_Exh	542322	1176866
Gen1314Exh_U	Diesel Centrale 2 - Generator 13/14 Stack Exhaust (18.5 MTPA+)		•	•	•	118.6	GenNew_Exh (x2)	542322	1176866
Gen15_Exh	Diesel Centrale 2 - Generator 15 Stack Exhaust (18.5 MTPA+)		•	•	•	115.6	GenNew_Exh	542315	1176863
Gen9_Exh	Diesel Centrale 1 - Generator 9 Stack Exhaust (Existing+)	•	•	•	•	109.7	Gen9_Exh	542381	1176890
MAR302	Rail Unloading - Rock Breaker 1 (18.5 MTPA+)		•	•	•	120.4	MAR302	542888	1177166
MAR303	Rail Unloading - Rock Breaker 2 (22.5 MTPA+)			•	•	120.4	MAR302	542902	1177171
RPL001	Outdoor Storage Bucket Reclaimer 1 (Existing+)	•	•	•	•	107.6	RPL301	542731	1176793
RPL002	Outdoor Storage Bucket Reclaimer 2 (Existing+)	•	•	•	•	107.6	RPL301	542711	1176678
TAN000	Transfer Tower Corner Island - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	540643	1176411
TAN001_Ex	Transfer Tower TA1 - Material Drop (Existing)	•				102.2	MD_Crushed	542864	1176843
TAN001_Up	Transfer Tower TA1 - Material Drop (18.5 MTPA+)		•	•	•	102.2	MD_Crushed	542868	1176845
TAN002	Transfer Tower TA2 - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	542900	1176748

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
TAN003	Transfer Tower TA3 - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	542592	1176633
TAN004_C4	Transfer Tower TA4 - Material Drop (from C4) (Existing+)	•	•	•	•	102.2	MD_Crushed	542567	1176730
TAN004_C5	Transfer Tower TA4 - Material Drop (from C5) (Existing+)	•	•	•	•	102.2	MD_Crushed	542555	1176725
TAN005	Transfer Tower TA5 - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	542534	1176726
TAN006	Transfer Tower TA6 - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	542502	1176813
TAN007	Transfer Tower TA7 - Material Drop (from C12) (Existing+)	•	•	•	•	102.2	MD_Crushed	542427	1176786
TAN007_C9	Transfer Tower TA7 - Material Drop (from C9) (Existing+)	•	•	•	•	102.2	MD_Crushed	542425	1176790
TAN008	Transfer Tower TA8 - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	542417	1176813
TAN020	Transfer Tower TA20 - Material Drop (Existing+)	•	•	•	•	102.2	MD_Crushed	542920	1176696
TAN300	Secondary Sizer Tower 1 - Material Drop to Screen (18.5 MTPA+)		•	•	•	102.2	MD_Crushed	542842	1177290
TAN301	Transfer Tower TA301 - Material Drop (18.5 MTPA+)		•	•	•	102.2	MD_Crushed	542749	1177255
TAN303	Transfer Tower TA303 - Material Drop (27.5 MTPA)				•	102.2	MD_Crushed	542805	1176954
TAN304	Transfer Tower TA304 - Material Drop (27.5 MTPA)				•	102.2	MD_Crushed	540653	1176411
TAN305	Transfer Tower TA305 - Material Drop (18.5 MTPA+)		•	•	•	102.2	MD_Crushed	542449	1176726
TAN306	Transfer Tower TA306 - Material Drop (27.5 MTPA)				•	102.2	MD_Crushed	542446	1176734
TAN307	Secondary Sizer Tower 2 - Material Drop to Screen (22.5 MTPA+)			•	•	102.2	MD_Crushed	542853	1177294
TAN309	Transfer Tower TA309 - Material Drop (27.5 MTPA)				•	102.2	MD_Crushed	540571	1176149
Area Sources									
AC14Ex_R	Air Compressor Building - 14 bar (Existing+) - Roof	•	•	•	•	99.2	Comp14Ex_Int	542423	1176938
AC7Ex_R	Air Compressor Building - 7 bar (Existing+) - Roof	•	•	•	•	94.9	Comp7Ex_Int	542403	1176944
ACNew18_R	Air Compressor Building (18.5 MTPA) - Roof		•			96.1	ACNew18_Int	542361	1176917
ACNew22_R	Air Compressor Building (22.5 MTPA) - Roof			•		98.5	ACNew22_Int	542361	1176917
ACNew27_R	Air Compressor Building (27.5 MTPA) - Roof				•	101.5	ACNew27_Int	542361	1176917
D1_RDBot	Dryer 1 - Rotary Dryer Bottom (Existing+)	•	•	•	•	116.0	Rotary_Dryer	542449	1176651
D1_RDTop	Dryer 1 - Rotary Dryer Top (Existing+)	•	•	•	•	116.0	Rotary_Dryer	542449	1176651
D2_RDBot	Dryer 2 - Rotary Dryer Bottom (Existing+)	•	•	•	•	116.0	Rotary_Dryer	542445	1176662
D2_RDTop	Dryer 2 - Rotary Dryer Top (Existing+)	•	•	•	•	116.0	Rotary_Dryer	542445	1176662
D3_RDBot	Dryer 3 - Rotary Dryer Bottom (Existing+)	•	•	•	•	116.0	Rotary_Dryer	542441	1176673
D3_RDTop	Dryer 3 - Rotary Dryer Top (Existing+)	•	•	•	•	116.0	Rotary_Dryer	542441	1176673
D4_RDBot	Dryer 4 - Rotary Dryer Bottom (18.5 MTPA+)		•	•	•	116.0	Rotary_Dryer	542403	1176705
D4_RDTop	Dryer 4 - Rotary Dryer Top (18.5 MTPA+)		•	•	•	116.0	Rotary_Dryer	542403	1176705
D5_RDBot	Dryer 5 - Rotary Dryer Bottom (27.5 MTPA)				•	116.0	Rotary_Dryer	542397	1176720
D5_RDTop	Dryer 5 - Rotary Dryer Top (27.5 MTPA)				•	116.0	Rotary_Dryer	542397	1176720
DC1_R1Ex	Diesel Centrale Building 1 (Existing) - Roof 1	•				97.5	DC1_IntExM	542410	1176901
DC1_R1Up	Diesel Centrale Building 1 (18.5 MTPA+) - Roof 1 (Upgrade)		•	•	•	91.5	DC1_IntUpM	542410	1176901
DC1_R3Ex	Diesel Centrale Building 1 (Existing) - Roof 2	•				99.0	DC1_IntExM	542405	1176890
DC1_R3Ex	Diesel Centrale Building 1 (Existing) - Roof 3	•				99.3	DC1_IntExM	542408	1176881
DC1_R3Up	Diesel Centrale Building 1 (18.5 MTPA+) - Roof 2 (Upgrade)		•	•	•	93.0	DC1_IntUpM	542405	1176890
DC1_R3Up	Diesel Centrale Building 1 (18.5 MTPA+) - Roof 3 (Upgrade)		•	•	•	93.3	DC1_IntUpM	542408	1176881

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
DC1_R4Ex	Diesel Centrale Building 1 (Existing) - Roof 4	•				98.1	DC1_IntExM	542419	1176875
DC1_R4Up	Diesel Centrale Building 1 (18.5 MTPA+) - Roof 4 (Upgrade)		•	•	•	92.1	DC1_IntUpM	542419	1176875
DC2_R1Ex	Diesel Centrale Building 2 (Existing) - Roof 1	•				100.9	DC2_IntExM	542315	1176867
DC2_R1Up	Diesel Centrale Building 2 (18.5 MTPA+) - Roof 1 (Upgrade)		•	•	•	101.9	DC2_IntUpM	542315	1176867
DC2_R2Ex	Diesel Centrale Building 2 (Existing) - Roof 2	•				100.9	DC2_IntExM	542318	1176858
DC2_R2Up	Diesel Centrale Building 2 (18.5 MTPA+) - Roof 2 (Upgrade)		•	•	•	101.9	DC2_IntUpM	542318	1176858
DC2_R3Ex	Diesel Centrale Building 2 (Existing) - Roof 3	•				100.9	DC2_IntExM	542321	1176849
DC2_R3Up	Diesel Centrale Building 2 (18.5 MTPA+) - Roof 3 (Upgrade)		•	•	•	101.9	DC2_IntUpM	542321	1176849
Dryer_BldgR1	Dryer Building (Existing+) - Roof 1	•	•	•	•	104.4	DEx_Bldg	542416	1176656
Dryer_BldgR2	Dryer Building (Existing+) - Roof 2	•	•	•	•	103.1	DEx_Bldg	542418	1176657
FOR304_R	Dryer 4 Building (18.5 MTPA | 22.5 MTPA) - Roof		•	•		102.3	D4_Bldg	542376	1176693
FOR304_RU	Dryer 4 Building (27.5 MTPA) - Roof (Upgrade)				•	102.3	D4_Bldg	542376	1176693
FOR305_R	Dryer 5 Building (27.5 MTPA) - Roof				•	102.1	D5_Bldg	542369	1176710
TAN010_REx	Transfer Tower TA10 (Existing+) - Roof	•	•	•	•	90.5	TAN010	542272	1176731
TAN010_RU1	Transfer Tower TA10 (18.5 MTPA) - Roof		•			90.9	TAN010_U1	542272	1176731
TAN010_RU2	Transfer Tower TA10 (22.5 MTPA+) - Roof			•	•	90.9	TAN010_U2	542272	1176731
TRE303_R	Transfer Tower TA100 (27.5 MTPA) - Roof				•	90.9	TRE303	542287	1176726
Vertical Area Sources									
AC14Ex_EW	Air Compressor Building - 14 bar (Existing+) - East Wall	•	•	•	•	93.5	Comp14Ex_Int	542432	1176935
AC14Ex_NW	Air Compressor Building - 14 bar (Existing+) - North Wall	•	•	•	•	94.7	Comp14Ex_Int	542428	1176946
AC14Ex_SW	Air Compressor Building - 14 bar (Existing+) - South Wall	•	•	•	•	94.7	Comp14Ex_Int	542418	1176930
AC14Ex_WW	Air Compressor Building - 14 bar (Existing+) - West Wall	•	•	•	•	93.5	Comp14Ex_Int	542414	1176941
AC7Ex_EW	Air Compressor Building - 7 Bar (Existing+) - East Wall	•	•	•	•	89.8	Comp7Ex_Int	542407	1176953
AC7Ex_NW	Air Compressor Building - 7 Bar (Existing+) - North Wall	•	•	•	•	89.7	Comp7Ex_Int	542395	1176948
AC7Ex_SW	Air Compressor Building - 7 Bar (Existing+) - South Wall	•	•	•	•	89.7	Comp7Ex_Int	542412	1176940
AC7Ex_WW	Air Compressor Building - 7 Bar (Existing+) - West Wall	•	•	•	•	89.8	Comp7Ex_Int	542399	1176935
ACNew18_EW	Air Compressor Building - New (18.5 MTPA) - East Wall		•			89.2	ACNew18_Int	542369	1176925
ACNew18_NW	Air Compressor Building - New (18.5 MTPA) - North Wall		•			92.6	ACNew18_Int	542350	1176918
ACNew18_SW	Air Compressor Building - New (18.5 MTPA) - South Wall		•			92.6	ACNew18_Int	542372	1176917
ACNew18_WW	Air Compressor Building - New (18.5 MTPA) - West Wall		•			89.2	ACNew18_Int	542353	1176910
ACNew22_EW	Air Compressor Building - New (22.5 MTPA) - East Wall			•		91.6	ACNew22_Int	542369	1176925
ACNew22_NW	Air Compressor Building - New (22.5 MTPA) - North Wall			•		95.0	ACNew22_Int	542350	1176918
ACNew22_SW	Air Compressor Building - New (22.5 MTPA) - South Wall			•		95.0	ACNew22_Int	542372	1176917
ACNew22_WW	Air Compressor Building - New (22.5 MTPA) - West Wall			•		91.6	ACNew22_Int	542353	1176910
ACNew27_EW	Air Compressor Building - New (27.5 MTPA) - East Wall				•	94.6	ACNew27_Int	542369	1176925
ACNew27_NW	Air Compressor Building - New (27.5 MTPA) - North Wall				•	98.0	ACNew27_Int	542350	1176918
ACNew27_SW	Air Compressor Building - New (27.5 MTPA) - South Wall				•	98.0	ACNew27_Int	542372	1176917
ACNew27_WW	Air Compressor Building - New (27.5 MTPA) - West Wall				•	94.6	ACNew27_Int	542353	1176910
D1_RDNor	Dryer 1 - Rotary Dryer North Side (Existing+)	•	•	•	•	117.5	Rotary_Dryer	542427	1176645

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
D1_RDSou	Dryer 1 - Rotary Dryer South Side (Existing+)	•	•	•	•	117.5	Rotary_Dryer	542472	1176657
D2_RDNor	Dryer 2 - Rotary Dryer North Side (Existing+)	•	•	•	•	117.5	Rotary_Dryer	542423	1176656
D2_RDSou	Dryer 2 - Rotary Dryer South Side (Existing+)	•	•	•	•	117.5	Rotary_Dryer	542468	1176668
D3_RDNor	Dryer 3 - Rotary Dryer North Side (Existing+)	•	•	•	•	117.5	Rotary_Dryer	542419	1176667
D3_RDSou	Dryer 3 - Rotary Dryer South Side (Existing+)	•	•	•	•	117.5	Rotary_Dryer	542464	1176679
D4_RDNor	Dryer 4 - Rotary Dryer North Side (18.5 MTPA+)		•	•	•	117.5	Rotary_Dryer	542380	1176699
D4_RDSou	Dryer 4 - Rotary Dryer South Side(18.5 MTPA+)		•	•	•	117.5	Rotary_Dryer	542425	1176711
D5_RDNor	Dryer 5 - Rotary Dryer North Side (27.5 MTPA)				•	117.5	Rotary_Dryer	542375	1176714
D5_RDSou	Dryer 5 - Rotary Dryer South Side (27.5 MTPA)				•	117.5	Rotary_Dryer	542420	1176726
DC1_AI1Ex	Diesel Centrale 1 Air Intake 1 (Existing)	•				100.2	DC1_IntExM	542371	1176863
DC1_AI1Up	Diesel Centrale 1 Air Intake 1 (18.5 MTPA+)		•	•	•	94.2	DC1_IntUpM	542371	1176863
DC1_AI2Ex	Diesel Centrale 1 Air Intake 2 (Existing)	•				100.2	DC1_IntExM	542374	1176864
DC1_AI2Up	Diesel Centrale 1 Air Intake 2 (18.5 MTPA+)		•	•	•	94.2	DC1_IntUpM	542374	1176864
DC1_BDEx	Diesel Centrale 1 Bay Door (Existing+)	•				106.2	DC1_IntExM	542444	1176901
DC1_BDUp	Diesel Centrale 1 Bay Door (18.5 MTPA+)		•	•	•	100.2	DC1_IntUpM	542444	1176901
DC1_EW1Ex	Diesel Centrale Building 1 (Existing) - East Wall 1	•				86.9	DC1_IntExM	542439	1176915
DC1_EW1Up	Diesel Centrale Building 1 (18.5 MTPA+) - East Wall 1 (Upgrade)		•	•	•	80.9	DC1_IntUpM	542439	1176915
DC1_EW2Ex	Diesel Centrale Building 1 (Existing) - East Wall 2	•				89.4	DC1_IntExM	542442	1176908
DC1_EW2Up	Diesel Centrale Building 1 (18.5 MTPA+) - East Wall 2 (Upgrade)		•	•	•	83.4	DC1_IntUpM	542442	1176908
DC1_EW3Ex	Diesel Centrale Building 1 (Existing) - East Wall 3	•				89.7	DC1_IntExM	542448	1176891
DC1_EW3Up	Diesel Centrale Building 1 (18.5 MTPA+) - East Wall 3 (Upgrade)		•	•	•	83.7	DC1_IntUpM	542448	1176891
DC1_EW4Ex	Diesel Centrale Building 1 (Existing) - East Wall 4	•				87.6	DC1_IntExM	542448	1176891
DC1_EW4Up	Diesel Centrale Building 1 (18.5 MTPA+) - East Wall 4 (Upgrade)		•	•	•	81.6	DC1_IntUpM	542448	1176891
DC1_NW1Ex	Diesel Centrale Building 1 (Existing) - North Wall 1	•				95.9	DC1_IntExM	542378	1176893
DC1_NW1Up	Diesel Centrale Building 1 (18.5 MTPA+) - North Wall 1 (Upgrade)		•	•	•	89.9	DC1_IntUpM	542378	1176893
DC1_NW2Ex	Diesel Centrale Building 1 (Existing) - North Wall 2	•				92.4	DC1_IntExM	542364	1176880
DC1_NW2Up	Diesel Centrale Building 1 (18.5 MTPA+) - North Wall 2 (Upgrade)		•	•	•	86.4	DC1_IntUpM	542364	1176880
DC1_NW3Ex	Diesel Centrale Building 1 (Existing) - North Wall 3	•				93.9	DC1_IntExM	542381	1176886
DC1_NW3Up	Diesel Centrale Building 1 (18.5 MTPA+) - North Wall 3 (Upgrade)		•	•	•	87.9	DC1_IntUpM	542381	1176886
DC1_SW1Ex	Diesel Centrale Building 1 (Existing) - South Wall 1	•				92.4	DC1_IntExM	542370	1176862
DC1_SW1Up	Diesel Centrale Building 1 (18.5 MTPA+) - South Wall 1 (Upgrade)		•	•	•	86.4	DC1_IntUpM	542370	1176862
DC1_SW2Ex	Diesel Centrale Building 1 (Existing) - South Wall 2	•				93.9	DC1_IntExM	542387	1176868
DC1_SW2Up	Diesel Centrale Building 1 (18.5 MTPA+) - South Wall 2 (Upgrade)		•	•	•	87.9	DC1_IntUpM	542387	1176868
DC1_SW3Ex	Diesel Centrale Building 1 (Existing) - South Wall 3	•				95.9	DC1_IntExM	542451	1176882
DC1_SW3Up	Diesel Centrale Building 1 (18.5 MTPA+) - South Wall 3 (Upgrade)		•	•	•	89.9	DC1_IntUpM	542451	1176882
DC1_WW1Ex	Diesel Centrale Building 1 (Existing) - West Wall 1	•				86.8	DC1_IntExM	542381	1176886
DC1_WW1Up	Diesel Centrale Building 1 (18.5 MTPA+) - West Wall 1 (Upgrade)		•	•	•	80.8	DC1_IntUpM	542381	1176886
DC1_WW2Ex	Diesel Centrale Building 1 (Existing) - West Wall 2	•				89.5	DC1_IntExM	542367	1176871
DC1_WW2Up	Diesel Centrale Building 1 (18.5 MTPA+) - West Wall 2 (Upgrade)		•	•	•	83.5	DC1_IntUpM	542367	1176871

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
DC1_WW3Ex	Diesel Centrale Building 1 (Existing) - West Wall 3	•				89.7	DC1_IntExM	542367	1176871
DC1_WW3Up	Diesel Centrale Building 1 (18.5 MTPA+) - West Wall 3 (Upgrade)		•	•	•	83.7	DC1_IntUpM	542367	1176871
DC1_WW4Ex	Diesel Centrale Building 1 (Existing) - West Wall 4	•				87.4	DC1_IntExM	542390	1176860
DC1_WW4Up	Diesel Centrale Building 1 (18.5 MTPA+) - West Wall 4 (Upgrade)		•	•	•	81.4	DC1_IntUpM	542390	1176860
DC2_AC1	Diesel Centrale Building 2 (Existing+) - Air Cooler 1	•	•	•	•	105.4	DC2_AC	542329	1176840
DC2_AC2	Diesel Centrale Building 2 (Existing+) - Air Cooler 2	•	•	•	•	105.4	DC2_AC	542336	1176842
DC2_AC3	Diesel Centrale Building 2 (18.5 MTPA+) - Air Cooler 3		•	•	•	105.4	DC2_AC	542322	1176837
DC2_EW1Ex	Diesel Centrale Building 2 (Existing) - East Wall 1	•				93.8	DC2_IntExM	542333	1176869
DC2_EW1Up	Diesel Centrale Building 2 (18.5 MTPA+) - East Wall 1 (Upgrade)		•	•	•	94.8	DC2_IntUpM	542333	1176869
DC2_EW2Ex	Diesel Centrale Building 2 (Existing) - East Wall 2	•				96.3	DC2_IntExM	542336	1176859
DC2_EW2Up	Diesel Centrale Building 2 (18.5 MTPA+) - East Wall 2 (Upgrade)		•	•	•	97.3	DC2_IntUpM	542336	1176859
DC2_EW3Ex	Diesel Centrale Building 2 (Existing) - East Wall 3	•				96.3	DC2_IntExM	542339	1176850
DC2_EW3Up	Diesel Centrale Building 2 (18.5 MTPA+) - East Wall 3 (Upgrade)		•	•	•	97.3	DC2_IntUpM	542339	1176850
DC2_Gen11_Int	Diesel Centrale 2 - Generator 11 Air Intake (Existing+)	•	•	•	•	101.4	Gen12_Int	542327	1176875
DC2_Gen12_Int	Diesel Centrale 2 - Generator 12 Air Intake (18.5 MTPA+)		•	•	•	101.4	Gen12_Int	542324	1176874
DC2_Gen13_Int	Diesel Centrale 2 - Generator 13 Air Intake (Existing+)	•	•	•	•	101.4	Gen12_Int	542321	1176873
DC2_Gen14_Int	Diesel Centrale 2 - Generator 14 Air Intake (18.5 MTPA+)		•	•	•	101.4	Gen12_Int	542317	1176871
DC2_Gen15_Int	Diesel Centrale 2 - Generator 15 Air Intake (18.5 MTPA+)		•	•	•	101.4	Gen12_Int	542311	1176869
DC2_NW1Ex	Diesel Centrale Building 2 (Existing) - North Wall 1	•				99.3	DC2_IntExM	542329	1176878
DC2_NW1Up	Diesel Centrale Building 2 (18.5 MTPA+) - North Wall 1 (Upgrade)		•	•	•	100.3	DC2_IntUpM	542329	1176878
DC2_NW2Ex	Diesel Centrale Building 2 (Existing) - North Wall 2	•				96.8	DC2_IntExM	542333	1176869
DC2_NW2Up	Diesel Centrale Building 2 (18.5 MTPA+) - North Wall 2 (Upgrade)		•	•	•	97.8	DC2_IntUpM	542333	1176869
DC2_SWEx	Diesel Centrale Building 2 (Existing) - South Wall	•				101.3	DC2_IntExM	542306	1176838
DC2_SWUp	Diesel Centrale Building 2 (18.5 MTPA+) - South Wall (Upgrade)		•	•	•	102.3	DC2_IntUpM	542306	1176838
DC2_WW1Ex	Diesel Centrale Building 2 (Existing) - West Wall 1	•				93.8	DC2_IntExM	542296	1176866
DC2_WW1Up	Diesel Centrale Building 2 (18.5 MTPA+) - West Wall 1 (Upgrade)		•	•	•	94.8	DC2_IntUpM	542296	1176866
DC2_WW2Ex	Diesel Centrale Building 2 (Existing) - West Wall 2	•				96.3	DC2_IntExM	542300	1176857
DC2_WW2Up	Diesel Centrale Building 2 (18.5 MTPA+) - West Wall 2 (Upgrade)		•	•	•	97.3	DC2_IntUpM	542300	1176857
DC2_WW3Ex	Diesel Centrale Building 2 (Existing) - West Wall 3	•				96.3	DC2_IntExM	542303	1176848
DC2_WW3Up	Diesel Centrale Building 2 (18.5 MTPA+) - West Wall 3 (Update)		•	•	•	97.3	DC2_IntUpM	542303	1176848
Dryer_BldgEW	Dryer Building (Existing+) - East Wall	•	•	•	•	96.7	DB_ExInt	542413	1176683
Dryer_BldgNW1	Dryer Building (Existing+) - North Wall 1	•	•	•	•	89.5	DB_ExInt	542405	1176680
Dryer_BldgNW2	Dryer Building (Existing+) - North Wall 2	•	•	•	•	88.8	DB_ExInt	542405	1176680
Dryer_BldgNWO	Dryer Building (Existing+) - North Wall Opening	•	•	•	•	98.0	DB_ExInt	542407	1176681
Dryer_BldgSW1	Dryer Building (Existing+) - South Wall 1	•	•	•	•	87.3	DB_ExInt	542414	1176628
Dryer_BldgSW2	Dryer Building (Existing+) - South Wall 2	•	•	•	•	88.8	DB_ExInt	542431	1176633
Dryer_BldgSW3	Dryer Building (Existing+) - South Wall 3	•	•	•	•	84.7	DB_ExInt	542396	1176660
Dryer_BldgWW1	Dryer Building (Existing+) - West Wall 1	•	•	•	•	88.4	DB_ExInt	542391	1176675
Dryer_BldgWW2	Dryer Building (Existing+) - West Wall 2	•	•	•	•	92.5	DB_ExInt	542402	1176662

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
Dryer_BldgWW3	Dryer Building (Existing+) - West Wall 3	•	•	•	•	90.7	DB_ExInt	542423	1176631
FOR304_EW	Dryer 4 Building (18.5 MTPA | 22.5 MTPA) - East Wall		•	•		107.3	D4_Bldg	542373	1176681
FOR304_EWU	Dryer 4 Building (27.5 MTPA) - East Wall (Update)				•	107.3	D4_Bldg	542378	1176704
FOR304_NW	Dryer 4 Building (18.5 MTPA | 22.5 MTPA) - North Wall		•	•		105.4	D4_Bldg	542366	1176700
FOR304_SW	Dryer 4 Building (18.5 MTPA | 22.5 MTPA) - South Wall		•	•		105.4	D4_Bldg	542385	1176686
FOR304_SWU	Dryer 4 Building (27.5 MTPA) - South Wall (Update)				•	105.4	D4_Bldg	542385	1176686
FOR304_WW	Dryer 4 Building (18.5 MTPA | 22.5 MTPA) - West Wall		•	•		107.3	D4_Bldg	542378	1176704
FOR304_WWU	Dryer 4 Building (27.5 MTPA) - West Wall (Update)				•	107.3	D4_Bldg	542373	1176681
FOR305_EW	Dryer 5 Building (27.5 MTPA) - East Wall				•	107.1	D5_Bldg	542372	1176721
FOR305_NW	Dryer 5 Building (27.5 MTPA) - North Wall				•	105.6	D5_Bldg	542360	1176717
FOR305_WW	Dryer 5 Building (27.5 MTPA) - West Wall				•	107.1	D5_Bldg	542366	1176700
PC_EO	Primary Crusher Building - East Wall Opening (Existing)	•				102.2	GrindBldg_Int	542768	1177075
PC_NO	Primary Crusher Building - North Wall Opening (Existing)	•				101.9	GrindBldg_Int	542746	1177067
PC_RCU_S	Primary Crusher Building - Rail Car Unloading (South) (Existing)	•				88.9	RUEx_Drop	542754	1177046
PC_RULN	Primary Crusher Building - Rail Car Unloading (North) (Existing)	•				88.9	RUEx_Drop	542746	1177067
PC_SO	Primary Crusher Building - South Wall Opening (Existing)	•				101.9	GrindBldg_Int	542754	1177046
PC_WO	Primary Crusher Building - West Wall Opening (Existing)	•				102.2	GrindBldg_Int	542745	1177066
SC_EO	Secondary Crusher Building - East Wall Opening (Existing)	•				99.8	GrindBldg_Int	542784	1177081
SC_NO	Secondary Crusher Building - North Wall Opening (Existing)	•				97.4	GrindBldg_Int	542771	1177076
SC_SO	Secondary Crusher Building - South Wall Opening (Existing)	•				97.4	GrindBldg_Int	542779	1177055
STE001_Ex	Dry Storage Building (Existing)	•				105.0	DSEx_Int	542486	1176878
STE001_N	Dry Storage Building North Opening (27.5 MTPA) - New Building				•	105.9	DSNew_Int	542833	1177021
STE001_NEx	Dry Storage Building - North Wall Opening (Existing)	•				106.9	DSEx_Int	542486	1176879
STE001_NUp	Dry Storage Building - North Wall Opening (18.5 MTPA+)		•	•	•	106.9	DSUp_Int	542486	1176879
STE001_S	Dry Storage Building South Opening (27.5 MTPA) - New Building				•	105.9	DSNew_Int	542864	1176934
STE001_SouEx	Dry Storage Building - South Wall Opening (Existing)	•				106.9	DSEx_Int	542512	1176807
STE001_SouUp	Dry Storage Building - South Wall Opening (18.5 MTPA+)		•	•	•	106.9	DSUp_Int	542512	1176807
STE001_Up	Dry Storage Building (18 MTPA+) - Update		•	•	•	105.0	DSUp_Int	542486	1176878
STE301	Dry Storage Building (27.5 MTPA) - New Building				•	104.9	DSNew_Int	542832	1177020
TAN010_EWEx	Transfer Tower TA10 (Existing) - East Wall	•				89.7	TAN010	542286	1176738
TAN010_EWU1	Transfer Tower TA10 (18.5 MTPA) - East Wall		•			90.1	TAN010_U1	542286	1176738
TAN010_EWU2	Transfer Tower TA10 (22.5 MTPA+) - East Wall			•	•	90.1	TAN010_U2	542286	1176738
TAN010_NWEx	Transfer Tower TA10 (Existing) - North Wall	•				95.4	TAN010	542256	1176732
TAN010_NWU1	Transfer Tower TA10 (18.5 MTPA) - North Wall		•			95.8	TAN010_U1	542256	1176732
TAN010_NWU2	Transfer Tower TA10 (22.5 MTPA+) - North Wall			•	•	95.8	TAN010_U2	542256	1176732
TAN010_SW1Ex	Transfer Tower TA10 (Existing) - South Wall 1	•				92.2	TAN010	542272	1176727
TAN010_SW1U1	Transfer Tower TA10 (18.5 MTPA) - South Wall 1		•			92.6	TAN010_U1	542272	1176727
TAN010_SW1U2	Transfer Tower TA10 (22.5 MTPA+) - South Wall 1			•	•	92.6	TAN010_U2	542272	1176727
TAN010_SW2Ex	Transfer Tower TA10 (Existing) - South Wall 2	•				92.7	TAN010	542288	1176730

Source ID	Source Name	Scenario (MTPA)				Overall PWL (dBA)	PWL Spectrum Identifier (see Annex B)	UTM Coordinates	
		Existing	18.5	22.5	27.5			X (m)	Y (m)
TAN010_SW2U1	Transfer Tower TA10 (18.5 MTPA) - South Wall 2		•			93.1	TAN010_U1	542288	1176730
TAN010_SW2U2	Transfer Tower TA10 (22.5 MTPA+) - South Wall 2			•	•	93.1	TAN010_U2	542288	1176730
TAN010_WWEx	Transfer Tower TA10 (Existing) - West Wall	•				89.9	TAN010	542258	1176724
TAN010_WWU1	Transfer Tower TA10 (18.5 MTPA) - West Wall		•			90.3	TAN010_U1	542258	1176724
TAN010_WWU2	Transfer Tower TA10 (22.5 MTPA+) - West Wall			•	•	90.3	TAN010_U2	542258	1176724
TRE303_EW	Transfer Tower TA100 (27.5 MTPA) - East Wall				•	90.1	TRE303	542302	1176733
TRE303_NW	Transfer Tower TA100 (27.5 MTPA) - North Wall				•	92.6	TRE303	542288	1176730
TRE303_SW	Transfer Tower TA100 (27.5 MTPA) - South Wall				•	95.9	TRE303	542303	1176725
TRE303_WW	Transfer Tower TA100 (27.5 MTPA) - West Wall				•	90.2	TRE303	542273	1176719

ANNEX B

KAMSAR SOURCE SOUND LEVEL INVENTORY

Table B.1: Kamsar Source Sound Power Level Inventory

Source Name	Level ID	Octave Band Centre Frequency (Hz)								Overall		Data Source
		63	125	250	500	1000	2000	4000	8000	dB	dBA	
Rail Unloading, Crushing and Transfer												
Conveyor C1 Motor (Existing)	CVY001	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (AECOM notes+Miller)
Material Drop - Crushed Ore (18.5 MTPA+)	MD_Crushed	110.9	102.5	97.2	96.2	100.0	92.8	85.7	80.7	115.9	102.2	SENES Database (34451-1)
Material Drop - Ore (Existing+)	MD_Ore	112.5	114.8	114.4	119.0	117.0	116.4	110.4	100.3	124.6	122.2	SENES Database (350288-002)
Primary Crusher (18.5 MTPA+)	PC	122.4	121.5	115.8	115.9	115.3	114.3	110.2	102.4	128.7	120.5	SENES Database (350288-002)
Rail Unloading - Apron Feeder Motor (18.5 MTPA+)	EXT301_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Rail Unloading - Rail Car Positioner (18.5 MTPA+)	CHG301	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Rail Unloading - Rock Breaker (18.5 MTPA+)	MAR302	111.3	110.5	108.8	116.7	114.9	114.0	111.6	105.3	122.1	120.4	SENES Database (350142)
Secondary Crusher (18.5 MTPA+)	SC	117.9	121.3	115.5	115.3	114.2	115.1	113.1	107.2	125.7	120.9	SENES Database (340562-1)
Vibrating Screen (18.5 MTPA+)	CBL302	--	--	--	--	--	--	--	--	--	93.4	SENES Database (350197)
Stockyard and Dryer Feed Conveyance												
Conveyor C2 Motor (Existing | 18.5MTPA)	CVY002	91.3	94.3	96.3	99.3	99.3	98.3	93.3	85.3	105.6	104.0	Calculation (Fluor spec+Miller)
Conveyor C2 Motor (22.5 MTPA | 27.5 MTPA)	CVY002_U	93.6	96.6	98.6	101.6	101.6	100.6	95.6	87.6	107.9	106.3	Calculation (Fluor spec+Miller)
Conveyor C3 Motor (Existing | 18.5MTPA)	CVY003	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C3 Motor (22.5 MTPA | 27.5 MTPA)	CVY003_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C4 Motor (Existing | 18.5MTPA)	CVY004	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C4 Motor (22.5 MTPA | 27.5 MTPA)	CVY004_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C5 Motor (Existing | 18.5MTPA)	CVY005	91.4	94.4	96.4	99.4	99.4	98.4	93.4	85.4	105.7	104.1	Calculation (Fluor spec+Miller)
Conveyor C5 Motor (22.5 MTPA | 27.5 MTPA)	CVY005_U	92.9	95.9	97.9	100.9	100.9	99.9	94.9	86.9	107.2	105.6	Calculation (Fluor spec+Miller)
Conveyor C6 Motor (Existing | 18.5 MTPA)	CVY006	90.5	93.5	95.5	98.5	98.5	97.5	92.5	84.5	104.8	103.2	Calculation (Fluor spec+Miller)
Conveyor C6 Motor (22.5 MTPA | 27.5 MTPA)	CVY006_U	91.1	94.1	96.1	99.1	99.1	98.1	93.1	85.1	105.4	103.8	Calculation (Fluor spec+Miller)
Conveyor C16 Motor (Existing | 18.5 MTPA)	CVY016	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor Spec+Miller)
Conveyor C16 Motor (22.5 MTPA | 27.5 MTPA)	CVY016_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C20 Motor (Existing | 18.5MTPA)	CVY020	91.3	94.3	96.3	99.3	99.3	98.3	93.3	85.3	105.6	104.0	Calculation (Fluor spec+Miller)
Conveyor C20 Motor (22.5 MTPA | 27.5 MTPA)	CVY020_U	93.6	96.6	98.6	101.6	101.6	100.6	95.6	87.6	107.9	106.3	Calculation (Fluor spec+Miller)
Conveyor C30 Motor (Existing | 18.5MTPA)	CVY030	93.1	96.1	98.1	101.1	101.1	100.1	95.1	87.1	107.4	105.8	Calculation (Fluor spec+Miller)
Conveyor C30 Motor (22.5 MTPA | 27.5 MTPA)	CVY030_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C301 Motor (18.5 MTPA+)	CVY301	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C303 Motor (18.5 MTPA+)	CVY303	93.6	96.6	98.6	101.6	101.6	100.6	95.6	87.6	107.9	106.3	Calculation (Fluor spec+Miller)
Conveyor C304 Motor (18.5 MTPA+)	CVY304	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Bucket Reclaimer (Existing+)	RPL301	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Material Drying and Conveyance												
Conveyor C8 Motor (Existing)	CVY008	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C9 Motor (Existing)	CVY009	92.2	95.2	97.2	100.2	100.2	99.2	94.2	86.2	106.5	104.9	Calculation (Fluor spec+Miller)
Conveyor C9 Motor (18.5 MTPA)	CVY009_U	94.4	97.4	99.4	102.4	102.4	101.4	96.4	88.4	108.7	107.1	Calculation (Fluor spec+Miller)
Conveyor C10 Motor (Existing)	CVY010	90.5	93.5	95.5	98.5	98.5	97.5	92.5	84.5	104.8	103.2	Calculation (Fluor spec+Miller)
Conveyor C10 Motor (18.5 MTPA+)	CVY010_U	92.4	95.4	97.4	100.4	100.4	99.4	94.4	86.4	106.7	105.1	Calculation (Fluor spec+Miller)
Conveyor C11 Motor (Existing)	CVY011	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C11 Motor (18.5 MTPA+)	CVY011_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)

Source Name	Level ID	Octave Band Centre Frequency (Hz)								Overall		Data Source
		63	125	250	500	1000	2000	4000	8000	dB	dBA	
Conveyor C80 Motor (18.5 MTPA+)	CVY380	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C305 Motor (27.5 MTPA)	CVY305	90.1	93.1	95.1	98.1	98.1	97.1	92.1	84.1	104.4	102.8	Calculation (Fluor spec+Miller)
Conveyor C306 Motor (18.5 MTPA+)	CVY306	91.9	94.9	96.9	99.9	99.9	98.9	93.9	85.9	106.2	104.6	Calculation (Fluor spec+Miller)
Conveyor C307 Motor (27.5 MTPA)	CVY307	91.9	94.9	96.9	99.9	99.9	98.9	93.9	85.9	106.2	104.6	Calculation (Fluor spec+Miller)
Dryer Draft Fan Motor (Single Fan) (Existing+)	Dryer_Fan	114.0	114.0	113.0	106.0	103.0	96.0	91.0	86.0	118.8	109.1	Surrogate manufacturer data (Twin City)
Dryer Rotary Gear Drive (Existing+)	FOR001	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Dryer Rpt+Miller)
Dryer - Air Heater (Existing+)	D1_Heater	111.4	112.7	113.0	110.3	107.7	104.7	99.2	108.8	120.0	114.0	Measurement Data (30Jul14)
Dryer - Dilution Fan (Existing+)	D1_DF	116.6	118.9	121.8	115.4	113.9	110.1	106.7	99.2	126.3	119.2	Measurement Data (30Jul14)
Dryer 1 - Exhaust Draft Fan Motor (Existing+)	D1_EDF	110.6	108.9	106.4	103.7	100.9	98.1	97.8	93.8	116.6	107.0	Measurement Data (30Jul14)
Dryer 2 - Exhaust Draft Fan Motor (Existing+)	D2_EDF	111.8	116.8	110.9	107.2	101.7	98.4	97.2	94.1	120.3	109.4	Measurement Data (30Jul14)
Dryer 3 - Exhaust Draft Fan Motor (Existing+)	D3_EDF	111.2	113.9	111.2	106.0	103.5	101.8	104.1	101.1	119.0	111.1	Measurement Data (30Jul14)
Dryer 4 Apron Feeder Inlet/Outlet (18.5 MTPA+)	EXT303_4	91.9	94.9	96.9	99.9	99.9	98.9	93.9	85.9	106.2	104.6	Calculation (Fluor spec+Miller)
Rotary Dryer Drum (Existing+) PWL"	Rotary_Dryer	76.3	80.4	88.2	90.9	89.1	84.3	79.0	71.7	95.2	92.9	Measurement Data (30Jul14)+calc
Dry Storage and Shiploading												
Conveyor C12 Motor (Existing | 18.5 MTPA)	CVY012	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C12 Motor (22.5 MTPA | 27.5 MTPA)	CVY012_U	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor T1 Motor (Existing+)	CVY017	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor T2 Motor (Existing+)	CVY018	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor T2 Motor (18.5MTPA+)	CVY018_U	97.9	100.9	102.9	105.9	105.9	104.9	99.9	91.9	112.2	110.6	Calculation (Fluor spec+Miller)
Conveyor T20 (27.5 MTPA)	CVY318	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Conveyor C110 Motor (27.5 MTPA)	CVY311	94.4	97.4	99.4	102.4	102.4	101.4	96.4	88.4	108.7	107.1	Calculation (Fluor spec+Miller)
Conveyor C120 Motor (27.5 MTPA)	CVY312	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Dry Storage Building Bucket Reclaimer (Existing+)	RPL301	94.9	97.9	99.9	102.9	102.9	101.9	96.9	88.9	109.2	107.6	Calculation (Fluor spec+Miller)
Transfer Tower TA10 Apron Feeder (Existing)	EXT307	91.9	94.9	96.9	99.9	99.9	98.9	93.9	85.9	106.2	104.6	Calculation (Fluor spec+Miller)
Transfer Tower TA10 Apron Feeder (18.5 MTPA+)	EXT307_U	94.1	97.1	99.1	102.1	102.1	101.1	96.1	88.1	108.4	106.8	Calculation (Fluor spec+Miller)
Transfer Tower TA100 Apron Feeder (27.5 MTPA)	EXT308	94.1	97.1	99.1	102.1	102.1	101.1	96.1	88.1	108.4	106.8	Calculation (Fluor spec+Miller)
Support Services												
Diesel Centrale 2 Air Cooler (Existing+)	DC2_AC	109.5	112.6	108.5	102.6	97.6	93.6	93.3	85.5	116.5	105.4	Measurement Data (30Jul14)
Generator Unit 1-6 Exhaust (Existing+)	GenOld_Exh	131.3	137.3	133.3	125.3	121.3	115.3	105.3	97.3	141.1	128.9	Calculation (Miller)
Generator Unit 9 Exhaust (Existing+)	Gen9_Exh	128.5	134.5	130.5	122.5	118.5	112.5	102.5	94.5	138.3	126.1	Calculation (Miller)
Generator Unit 10 Exhaust (Existing+)	Gen10_Exh	131.1	137.1	133.1	125.1	121.1	115.1	105.1	97.1	140.9	128.7	Calculation (Miller)
Generator Unit 11-15 Exhaust (Existing+)	GenNew_Exh	146.3	145.0	130.0	128.8	120.0	120.0	112.5	--	149.7	132.1	Surrogate manufacturer data (Wartsila)
Generator 12 Air Intake (Existing+)	Gen12_Int	114.2	103.6	94.9	92.5	87.0	87.7	98.7	89.6	115.6	101.4	Measurement Data (30Jul14)
Heat Dump Radiator (Power Stations) (Existing+)	HDR	82.2	77.1	78.6	78.2	76.0	72.8	70.0	67.1	86.3	81.0	SENES Database (34491-1)
Air Compressor Unit (7 bar) (Existing+)	Comp7bar	99.0	104.0	103.0	101.0	104.0	109.0	106.0	99.0	113.8	112.9	Calculation (Beranek)
Air Compressor Unit (14 bar) (Existing+)	Comp14bar	100.3	105.3	104.3	102.3	105.3	110.3	107.3	100.3	115.1	114.2	Calculation (Beranek)

Table B.2: Kamsar Interior Sound Pressure Level Inventory

Source Name	Level ID	Octave Band Centre Frequency (Hz)								Overall		Data Source
		63	125	250	500	1000	2000	4000	8000	dB	dBA	
Air Compressor Building (7 bar) Interior (Existing)	Comp7Ex_Int	96.6	100.1	99.1	95.4	98.1	102.1	98.3	92.3	108.9	106.1	Calculated from Interior
Air Compressor Building (14 bar) Interior (Existing)	Comp14Ex_Int	101.1	104.6	103.6	99.9	102.6	106.6	102.8	96.7	113.4	110.6	Calculated from Interior
Air Compressor Building (New) Interior (18.5 MTPA)	ACNew18_Int	98.5	100.5	99.5	95.7	98.7	103.7	99.5	93.7	109.6	107.4	Calculated from Interior
Air Compressor Building (New) Interior (22.5 MTPA)	ACNew22_Int	100.9	102.9	101.9	98.1	101.1	106.1	101.9	96.1	112.0	109.8	Calculated from Interior
Air Compressor Building (New) Interior (27.5 MTPA)	ACNew27_Int	103.9	105.9	104.9	101.1	104.1	109.1	104.9	99.1	115.0	112.8	Calculated from Interior
Diesel Centrale 1 Interior (Existing) Measured	DC1_IntExM	97.5	98.7	99.9	100.1	96.5	92.5	95.6	89.4	106.9	102.7	Measurement Data (30Jul14)
Diesel Centrale 1 Interior (18.5 MTPA+) Measured	DC1_IntUpM	91.5	92.7	93.9	94.1	90.5	86.4	89.6	83.4	100.9	96.7	Measurement Data (30Jul14)
Diesel Centrale 2 Interior (Existing) Measured	DC2_IntExM	105.5	103.1	105.8	104.7	102.3	98.4	99.5	93.4	112.1	107.7	Measurement Data (30Jul14)
Diesel Centrale 2 Interior (18.5 MTPA+) Measured	DC2_IntUpM	106.5	104.1	106.8	105.7	103.3	99.4	100.5	94.4	113.1	108.7	Measurement Data (30Jul14)
Dryer Building (Existing)	DEx_Bldg	106.7	106.2	108.5	102.3	100.3	95.8	89.8	90.5	115.0	105.6	Calculated from Interior
Dryer Building Interior (Existing)	DB_ExInt	91.2	93.4	94.0	91.7	88.8	85.1	79.2	72.0	100.9	93.8	Measurement Data (30Jul14)
Dryer 4 Building (18.5 MTPA | 22.5 MTPA)	D4_Bldg	108.6	108.4	110.8	103.5	102.0	97.5	92.5	94.7	117.1	107.6	Calculated from Interior
Dryer 5 Building (27.5 MTPA)	D5_Bldg	108.9	108.7	111.1	103.7	102.2	97.6	92.6	95.0	117.4	107.8	Calculated from Interior
Dry Storage Building Interior (Existing)	DSEx_Int	89.1	81.2	80.3	81.0	81.2	78.5	72.8	65.9	96.1	85.2	Calculated from Interior
Dry Storage Building Interior (18.5 MTPA+)	DSUp_Int	89.1	81.2	80.3	81.0	81.2	78.5	72.8	65.9	96.1	85.2	Calculated from Interior
Dry Storage Building (New) Interior (27.5 MTPA)	DSNew_Int	88.4	80.4	79.4	80.0	80.3	77.6	71.9	64.9	95.4	84.3	Calculated from Interior
Grinding Building (Primary/Secondary Crushing) - Existing Interior	GrindBldg_Int	93.6	92.8	89.8	87.8	83.6	81.2	76.5	68.3	100.4	89.7	Measurement Data (30Jul14)
Rail Car Unloading - Interior Measurement (Existing)	RUEx_Drop	79.6	75.8	73.5	72.8	71.5	70.9	63.9	55.5	91.1	76.7	Measurement Data (30Jul14)
Transfer Tower TA10 - Interior (Existing)	TAN010	102.1	93.7	92.4	92.9	93.5	90.4	84.3	77.4	108.6	97.3	Calculated from Interior
Transfer Tower TA10 - Interior (18.5 MTPA)	TAN010_U1	102.1	94.0	93.0	93.7	94.1	91.2	85.1	78.2	108.7	98.0	Calculated from Interior
Transfer Tower TA10 - Interior (22.5 MTPA)	TAN010_U2	102.1	94.0	93.0	93.7	94.1	91.2	85.1	78.2	108.7	98.0	Calculated from Interior
Transfer Tower TA100 - Interior (27.5 MTPA)	TRE303	102.1	94.0	93.0	93.7	94.1	91.2	85.2	78.2	108.7	98.0	Calculated from Interior

ANNEX C

SANGARÉDI MINING REGION VILLAGE INFORMATION

Table C.1: Sangarédi Mining Region Village Information

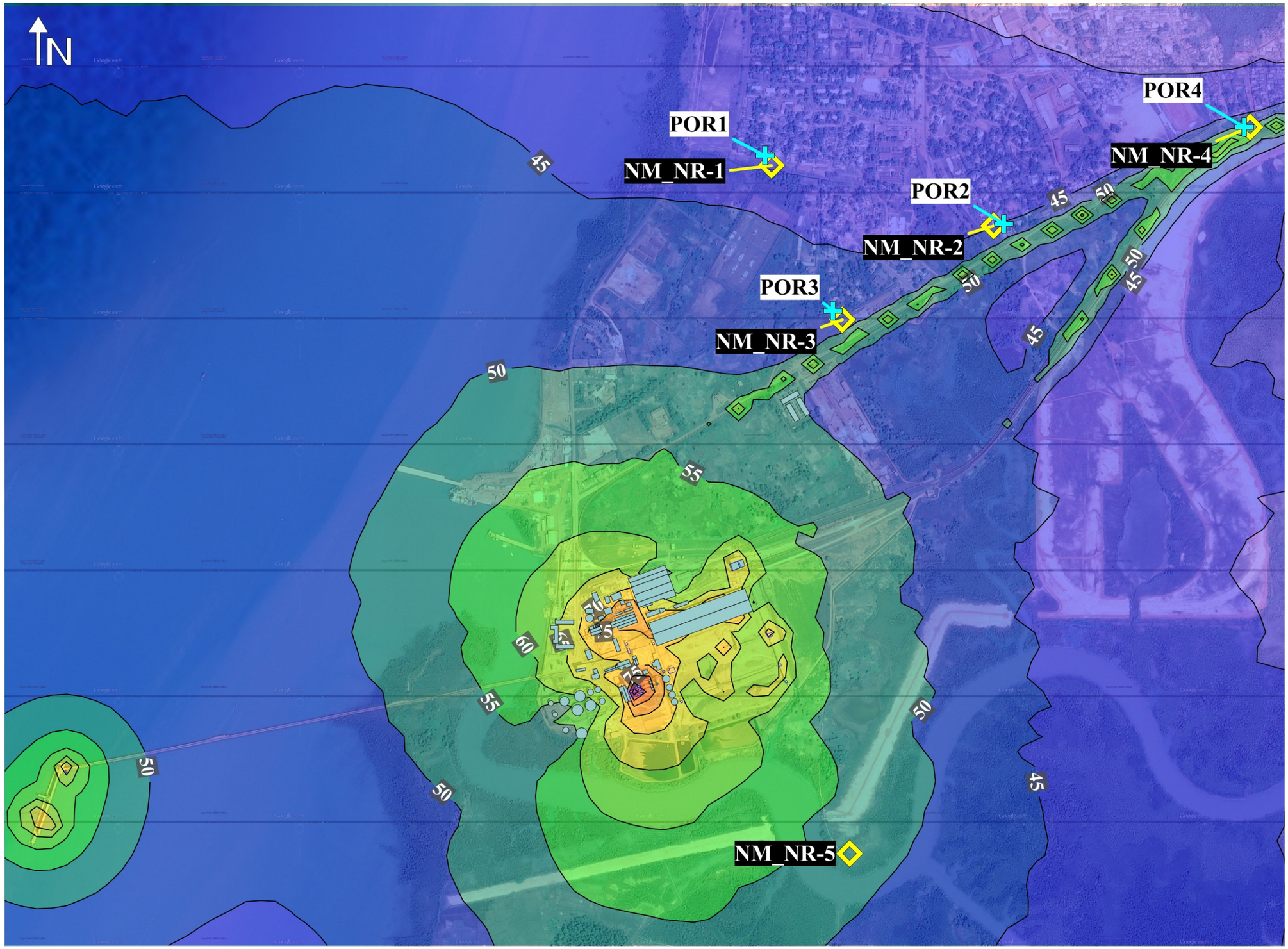
ID	Village Name	Schools	Households	Population	Village Coordinate	
					X (UTM-m)	Y (UTM-m)
1	Hamdalaye	1	64	416	622068	1225612
2	Fassely Fouta Bé	0	8	74	619273	1225222
3	Boulleré	2	157	1331	613813	1229945
4	Mbouroré	1	30	243	619794	1227780
5	Paragogo	0	73	541	623431	1229194
6	Ndantary	0	46	408	626801	1228206
7	Boundou Wandé	1	33	257	629180	1224050
8	Kagnéka	1	30	226	622313	1217654
9	Sintiourou Kaouri Bowé	0	6	53	623625	1215073
14	Madina Kankalaré	0	24	154	617864	1222066
15	Kankalaré	0	4	20	616644	1221209
57	Ndanta Fongné Dow	0	25	147	632940	1229539
58	Cogon Lengué	0	28	128	636315	1231917
59	Sambou1	0	11	63	632917	1233187
60	Sambou2	0	7	37	632625	1232621
61	Hore Sella1	0	7	53	631113	1232248
62	Hore Sella2	0	7	39	630790	1232242
63	Daba Dow	0	12	116	629718	1232647
64	Hore Sella 3	0	3	32	630126	1232219
65	Sella Roundé	0	17	117	631424	1234695
66	Passago	0	6	38	634599	1235947
67	Parawol Aliou	0	40	280	624773	1231141
68	Hore Lafou	1	41	307	621532	1221249
69	Lafou Mbayla	0	22	151	623242	1222018
70	Hafia1	1	32	287	626398	1219690
71	Ndiarindé Roundé	0	18	175	626536	1218770
72	Ndiarindé Missidé	0	51	484	626807	1218041
73	Sintiourou Hafia	0	23	165	626261	1221413
74	Koungnoubé	0	3	35	627083	1228745
75	Sintiourou Baladaroul	0	14	120	626930	1227681
76	Parawol Malassi	0	33	327	619404	1220111
82	Kalinko Guessoré	0	19	92	617162	1218657
83	Kahel Mbody	1	36	308	621991	1235668
85	Kourawel	1	48	296	620668	1234737
86	Sintiourou Kourawel	0	11	58	620520	1234352
87	Nyalé Dja´man	0	4	42	624944	1236350
88	Nyalé Moussa	1	57	297	625956	1235961
89	Nyalé Hogo	0	15	112	625791	1235731

ID	Village Name	Schools	Households	Population	Village Coordinate	
					X (UTM-m)	Y (UTM-m)
90	Nyalé Boussoura	0	27	195	625105	1235406
91	Sintiourou Boussoura	0	10	71	624880	1235331
92	Nyalé Missidé	0	8	41	626386	1235616
113	Daba Ley	0	16	98	629832	1233144
114	Sellawol	0	13	64	631870	1233668
115	Doumoun Cogon	0	13	64	632055	1236413
116	Lougal	1	20	170	624662	1215340
117	Djoloun	0	9	69	626701	1215803
127	Guegueré	1	55	377	616603	1226036
128	Fassely Belenderé	1	37	227	615064	1224519
129	Bandodji Touguidjé	0	39	202	617061	1228396
130	Bandodji Nyalbi	0	48	416	617435	1231300
131	Daara	0	4	29	617514	1234795
132	Bosseré	0	29	189	617660	1236410
133	Boundi Foulasso	0	38	239	612939	1235120
134	Feto Kewewol	0	12	105	612716	1232667
135	Pomboniwol	0	2	11	613089	1232138
136	Sintiourou Nalbewou	0	30	252	613674	1231254
140	Wendou Baga	0	6	62	628227	1215376
141	Pétoum Nyalbi	0	15	120	629012	1216757
142	Pora Hodho	1	22	157	630120	1216742
143	Sintiourou Thiéweré	0	15	115	630258	1217207
144	Sintiourou Sa´kou Timbi	0	4	30	630318	1216027
145	Pora Banla	0	4	20	630752	1216515
148	Diandian	1	127	757	634056	1216489
149	Parawol Kouradjé	0	26	185	619775	1219252
150	Sintiourou Hakoundethiangui	0	1	8	627528	1234017
151	Carrefour Parawol	0	5	36	631427	1221000
152	Madina Dian	1	60	423	632534	1221410
153	Sintiourou Nyaka	0	3	24	633019	1225317
154	Thiaghé	0	13	97	629460	1235277
155	Kalinko Pouta´	0	6	44	617466	1218229
156	Nyangaba	0	30	191	616920	1219524
157	Kalinko Ley	0	19	112	615117	1219666
158	Kalinko Ley 2	0	7	38	615466	1219708
159	Sintiourou Madina	0	3	34	615995	1219710
161	Telli Bofi	0	6	39	617460	1221104
162	Kankalaré Hacoudé	0	2	12	616865	1221416

ID	Village Name	Schools	Households	Population	Village Coordinate	
					X (UTM-m)	Y (UTM-m)
163	Parawi Saleah 1	0	21	224	616384	1222009
164	Parawi Saleah 2	0	9	57	616158	1222249
165	Parawi Saleah 3	0	11	66	616041	1222327
166	Parawi	0	16	135	615544	1222443
167	Feto Parawi 2	0	11	61	615324	1222481
169	Feto Parawi 1	0	17	128	614539	1222580
170	Bourreti	0	8	27	634972	1222476
171	Ndantari	0	24	142	636590	1221444
172	Sitako	0	27	195	634228	1218735
173	Sintiourou Daroul Diandian	1	17	148	636510	1217265
174	Kourawi	0	17	149	637638	1216121
175	Thiankwé	0	25	170	636808	1218746
176	Toumbeta	0	9	34	638548	1218739
179	Limbiko	0	12	87	633024	1217482
180	Karé Dabbhel	0	27	180	629803	1220878
181	Missira	1	20	159	627934	1219120
182	Sintiourou Missira	0	5	69	628336	1219497
183	Daroul	0	6	44	630465	1223614
184	Pora PK130	0	8	53	630416	1222978
185	Sakidjé	0	5	33	627533	1220875
187	Kalinko Roundé	1	52	319	619671	1216418
188	Thiangui Bonodji	0	1	8	629237	1235900
189	Sintiourou Kerkeré	0	11	64	636908	1215598
190	Sintiourou Toumbeta	0	2	12	638749	1218449
191	Ndanta Fongné Ley	0	48	307	633291	1229770
192	Sintiourou Lengueré	0	2	10	615545	1226616

ANNEX D

KAMSAR SOUND LEVEL CONTOUR PLOTS



LEGEND:

Sound Level (dBA): 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30

Sensitive Point of Reception

Noise Monitoring Location

NOTES:

The sound level contour lines depict the contribution from the Kamsar processing facility only, and do not incorporate background sound levels.

SCALE:

0 m — 400 m — 800 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

Basemap: Google Earth 2014

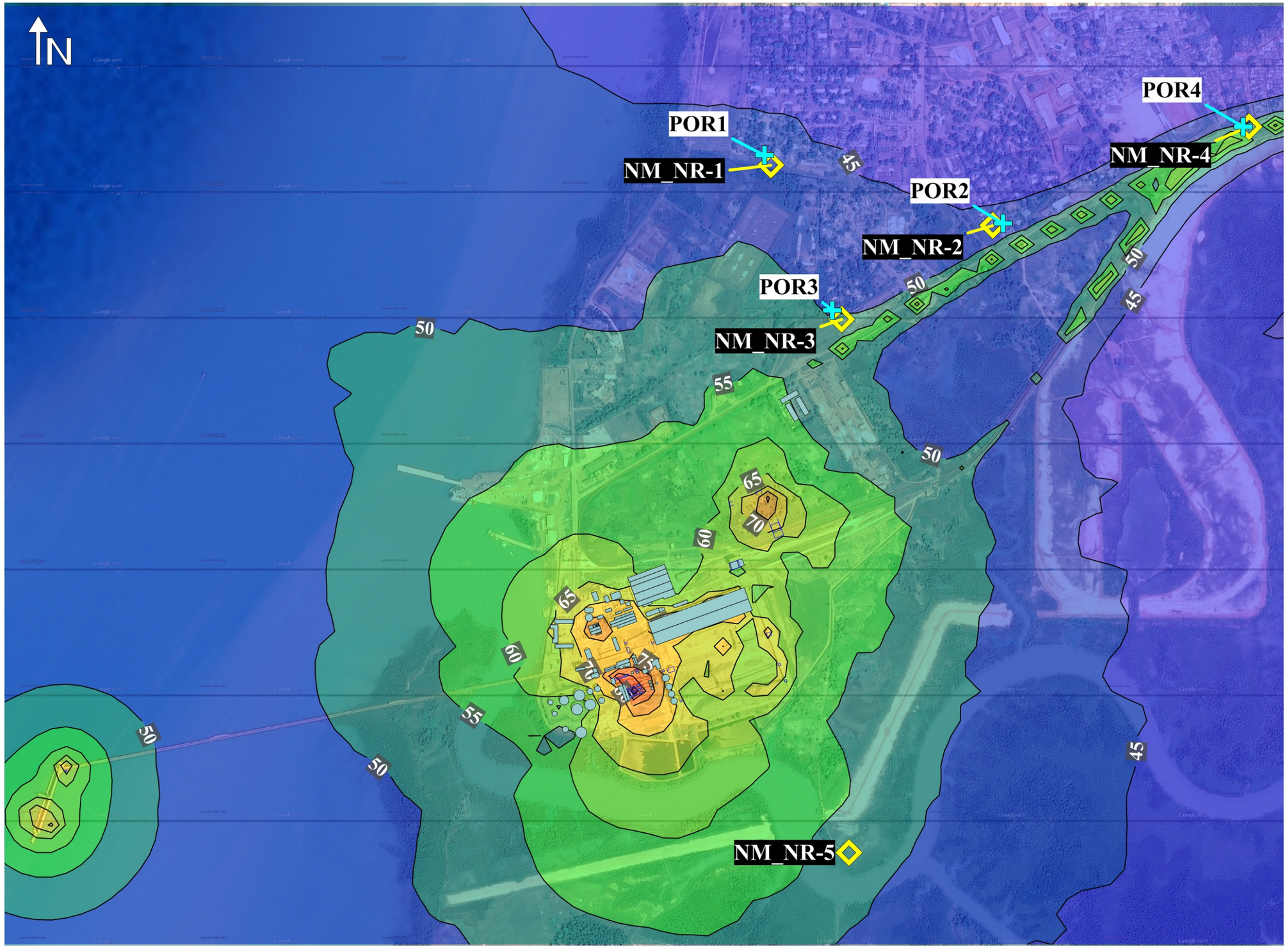
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée (CBG)

Sound Level Contours
Existing Conditions [Plant Only]

Kamsar, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	D.1
Date: Sept. 2014	Project Number: 350854	



LEGEND:

Sound Level (dBA): 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30

Sensitive Point of Reception

Noise Monitoring Location

NOTES:

The sound level contour lines depict the contribution from the Kamsar processing facility only, and do not incorporate background sound levels.

SCALE:

0 m — 400 m — 800 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

Basemap: Google Earth 2014

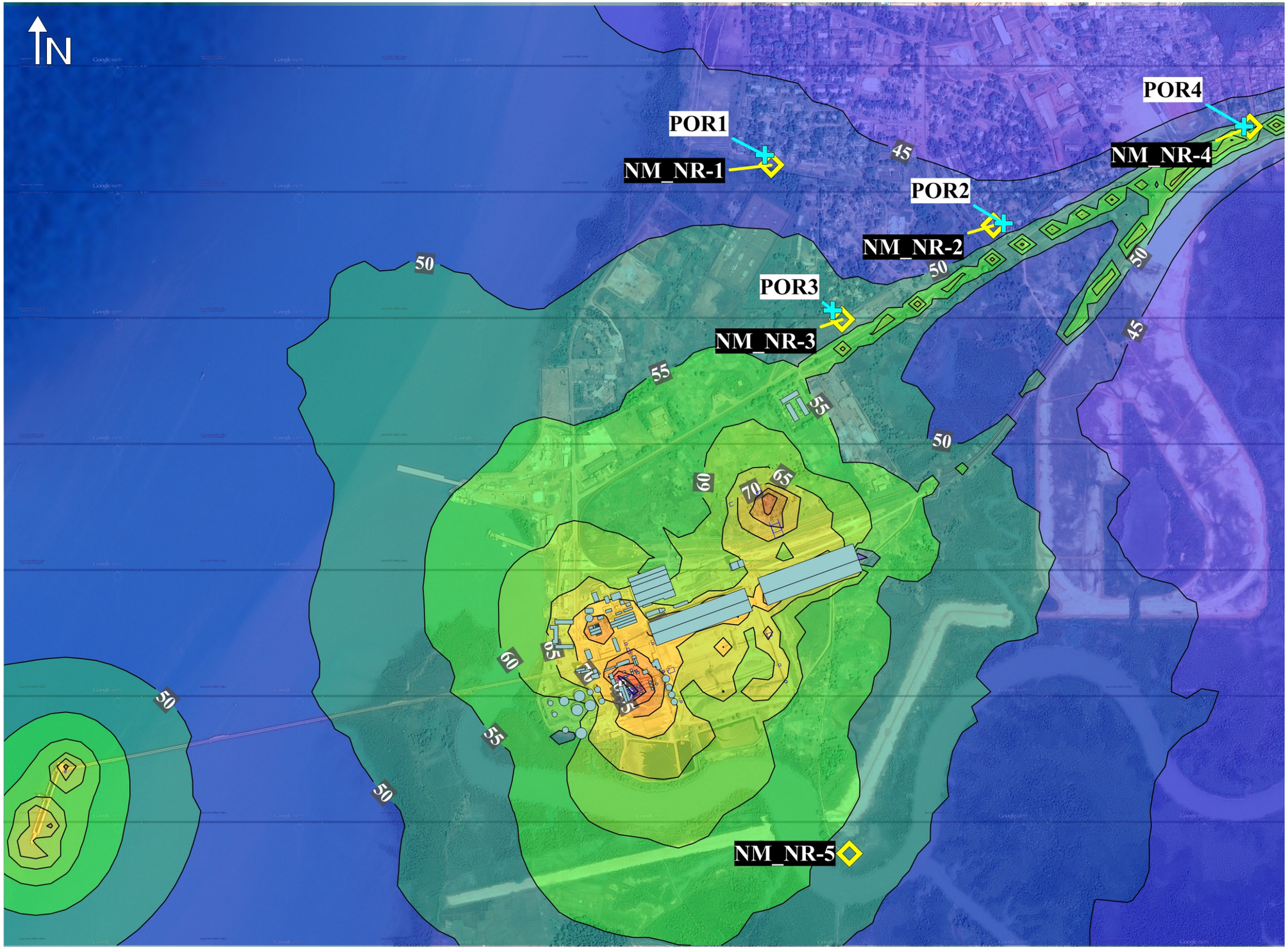
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée (CBG)

Sound Level Contours
18.5 MTPA Scenario [Plant Only]

Kamsar, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	D.2
Date: Sept. 2014	Project Number: 350854	



LEGEND:

Sound Level (dBA): 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30

Sensitive Point of Reception

Noise Monitoring Location

NOTES:

The sound level contour lines depict the contribution from the Kamsar processing facility only, and do not incorporate background sound levels.

SCALE:

0 m — 400 m — 800 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

Basemap: Google Earth 2014

SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée (CBG)

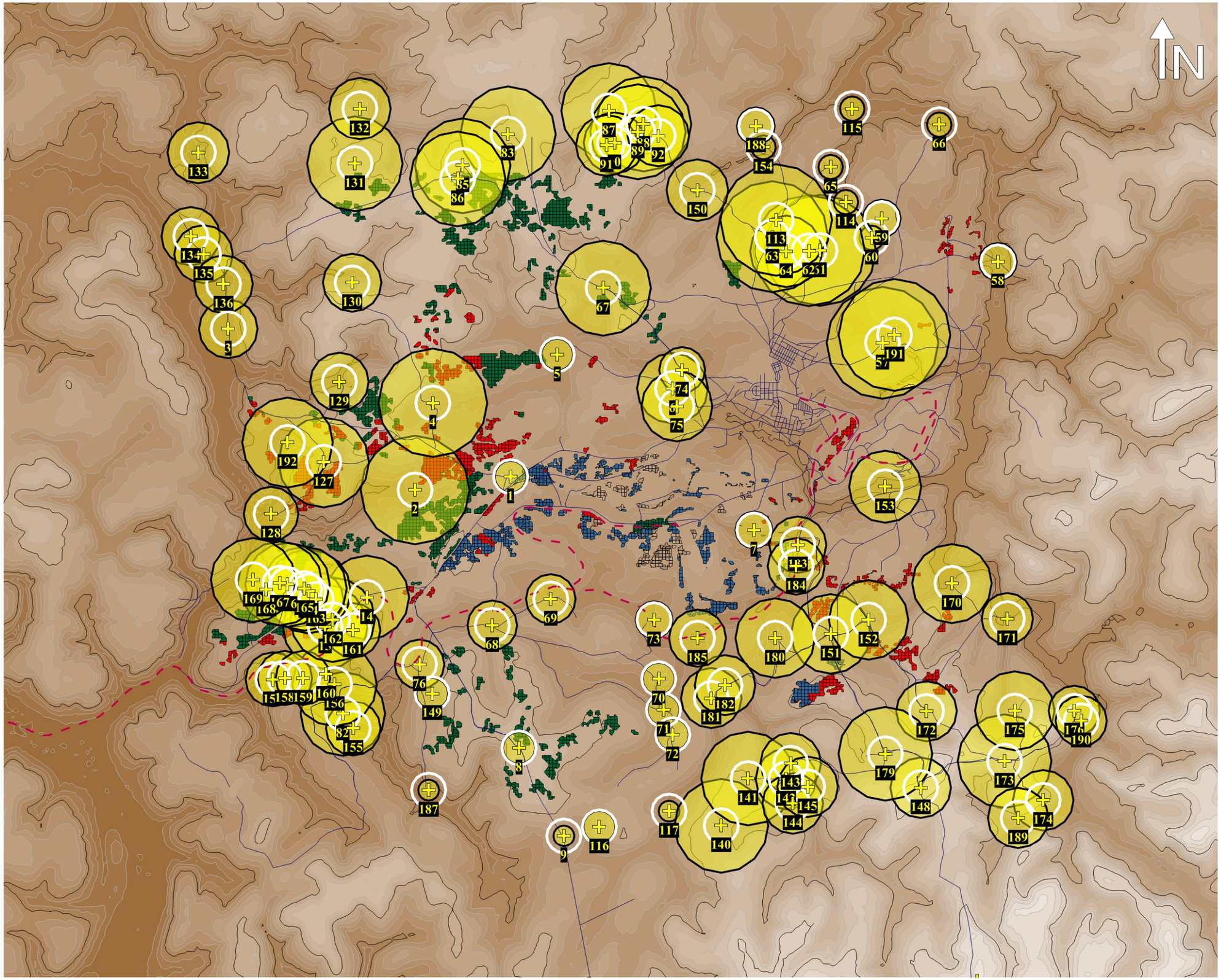
Sound Level Contours
27.5 MTPA Scenario [Plant Only]

Kamsar, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	D.4
Date: Sept. 2014	Project Number: 350854	

ANNEX E

SANGARÉDI MINING REGION – SETBACK DISTANCE PLOTS (IFC CRITERIA)



LEGEND:

- Village location
- 500 m setback
- Required setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

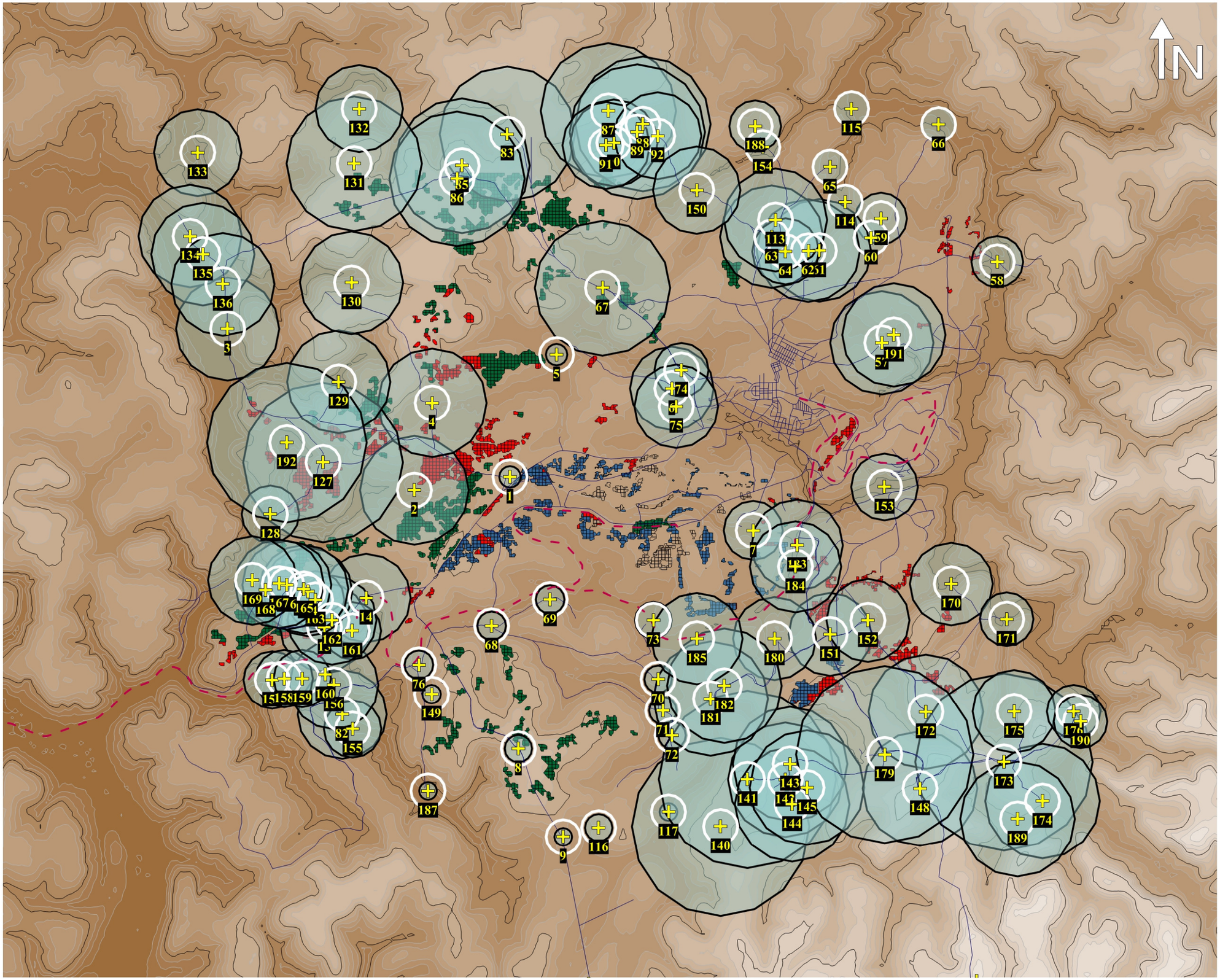
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for IFC Compliance (Day) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	E.1
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- Required setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

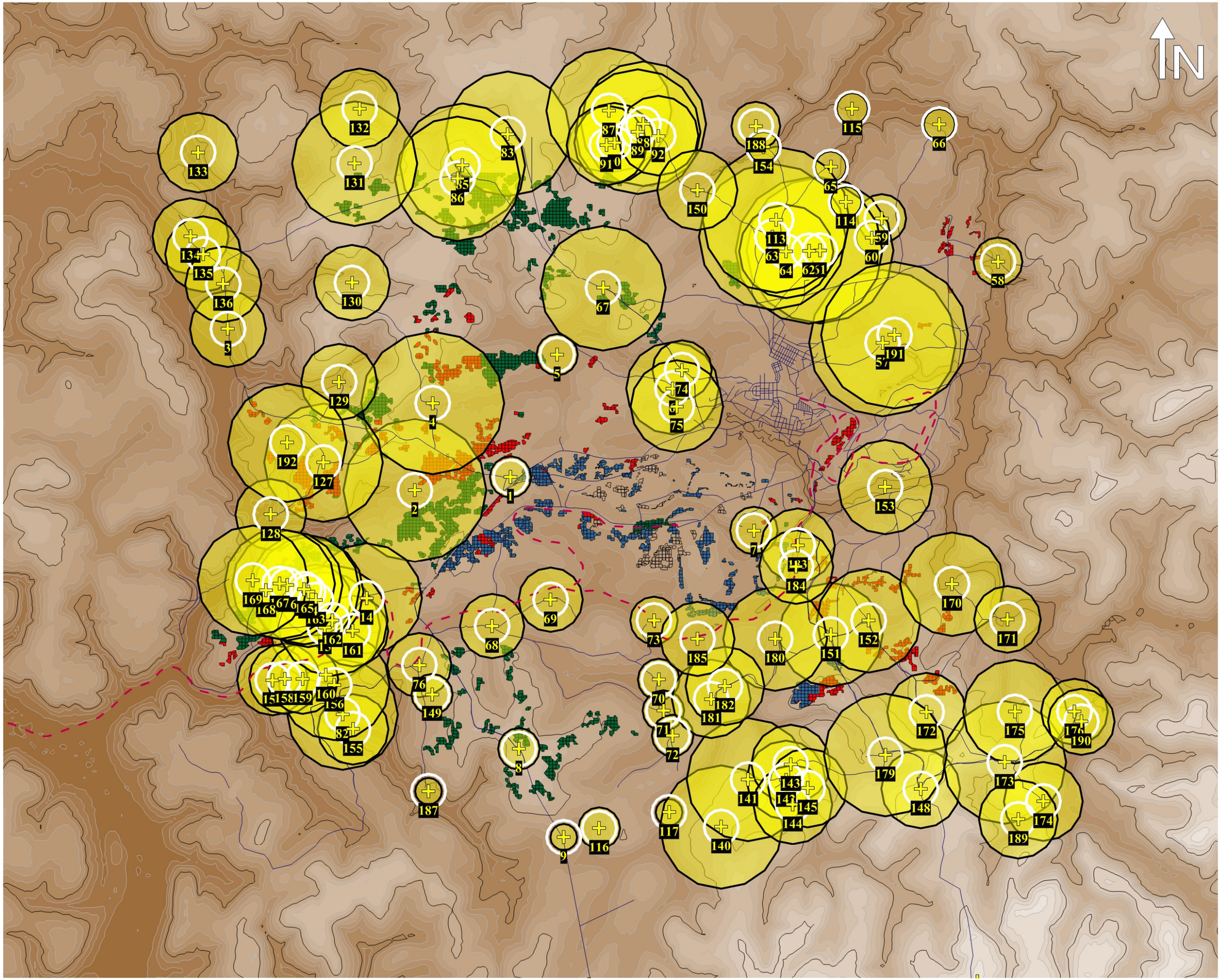
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for IFC Compliance (Night) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	E.2
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- Required setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

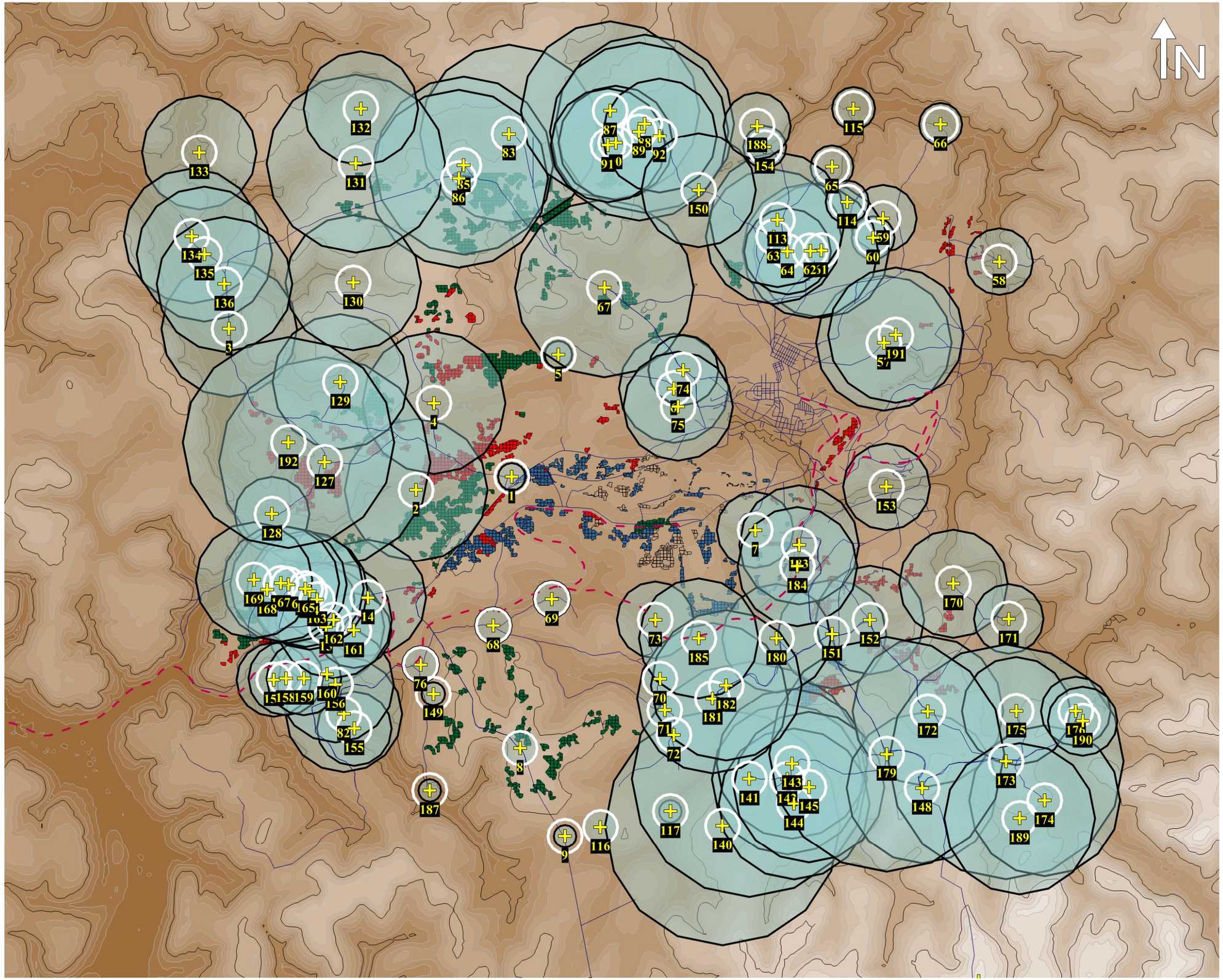
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for IFC Compliance (Day) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	E.3
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- Required setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

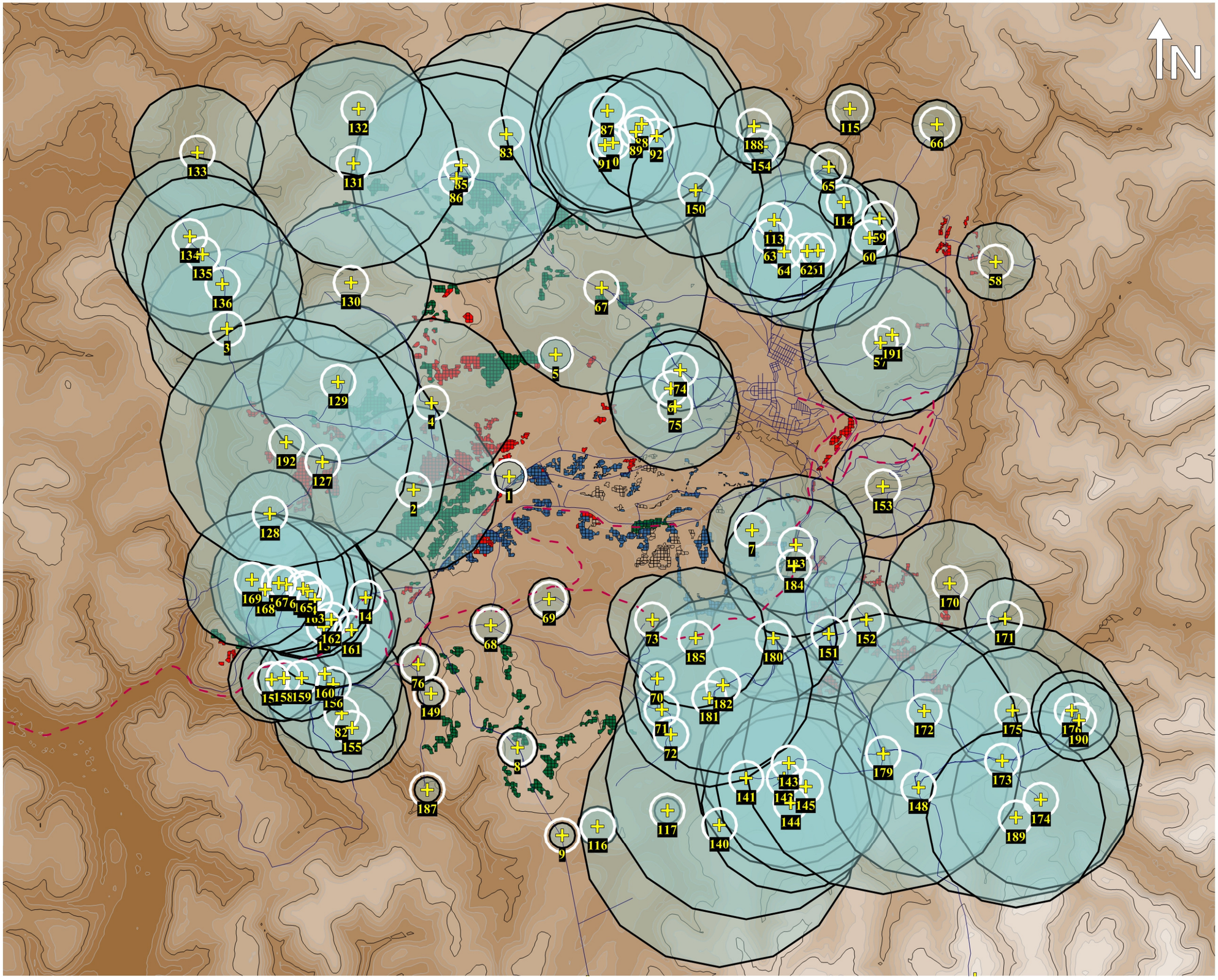
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for IFC Compliance (Night) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	E.4
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- Required setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

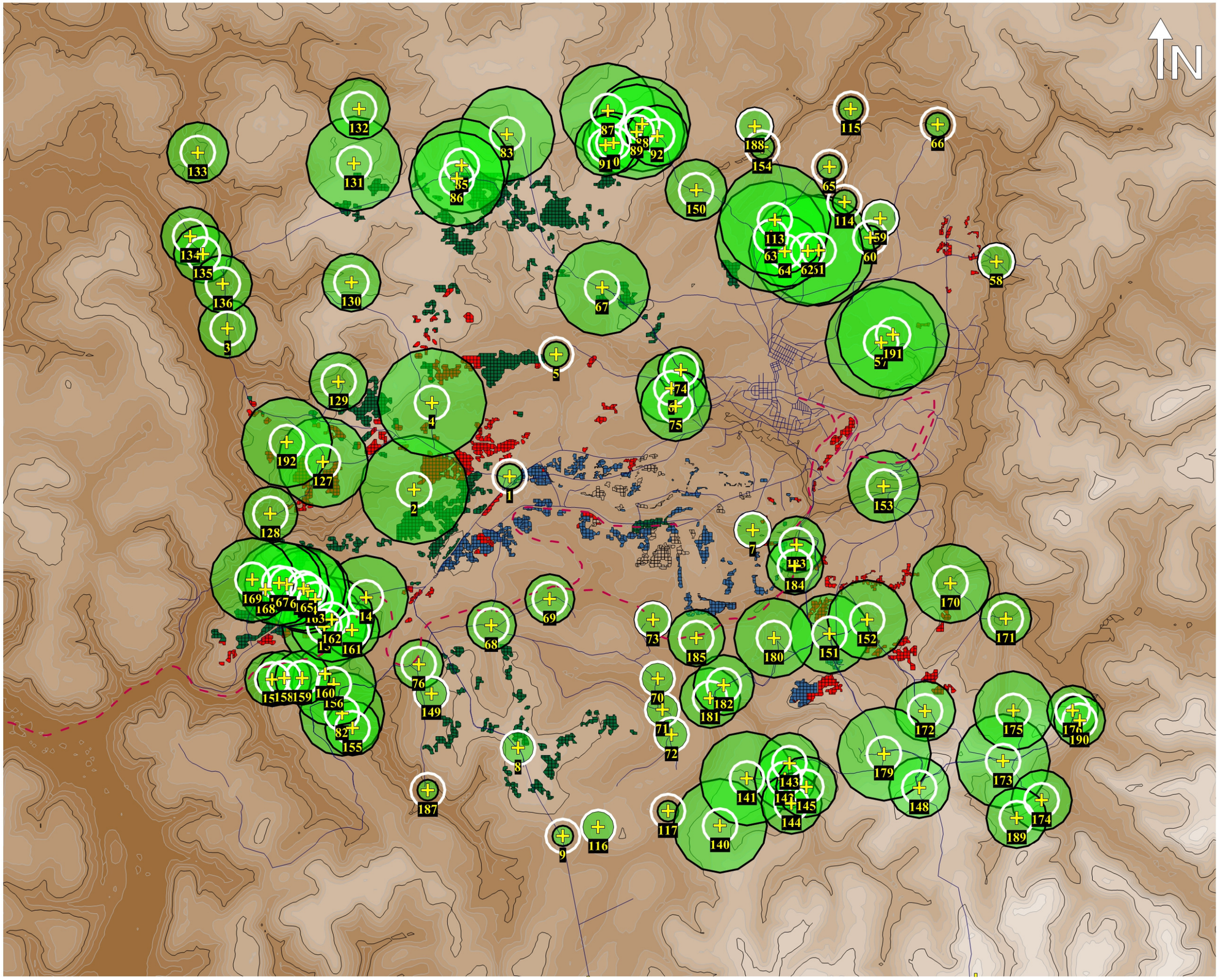
Village Setbacks Required for IFC Compliance (Night) [3 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	E.6
Date: Sept. 2014	Project Number: 350854	

ANNEX F

SANGARÉDI MINING REGION – SETBACK DISTANCE PLOTS (INCREMENTS)



LEGEND:

- Village location
- 500 m setback
- 3 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

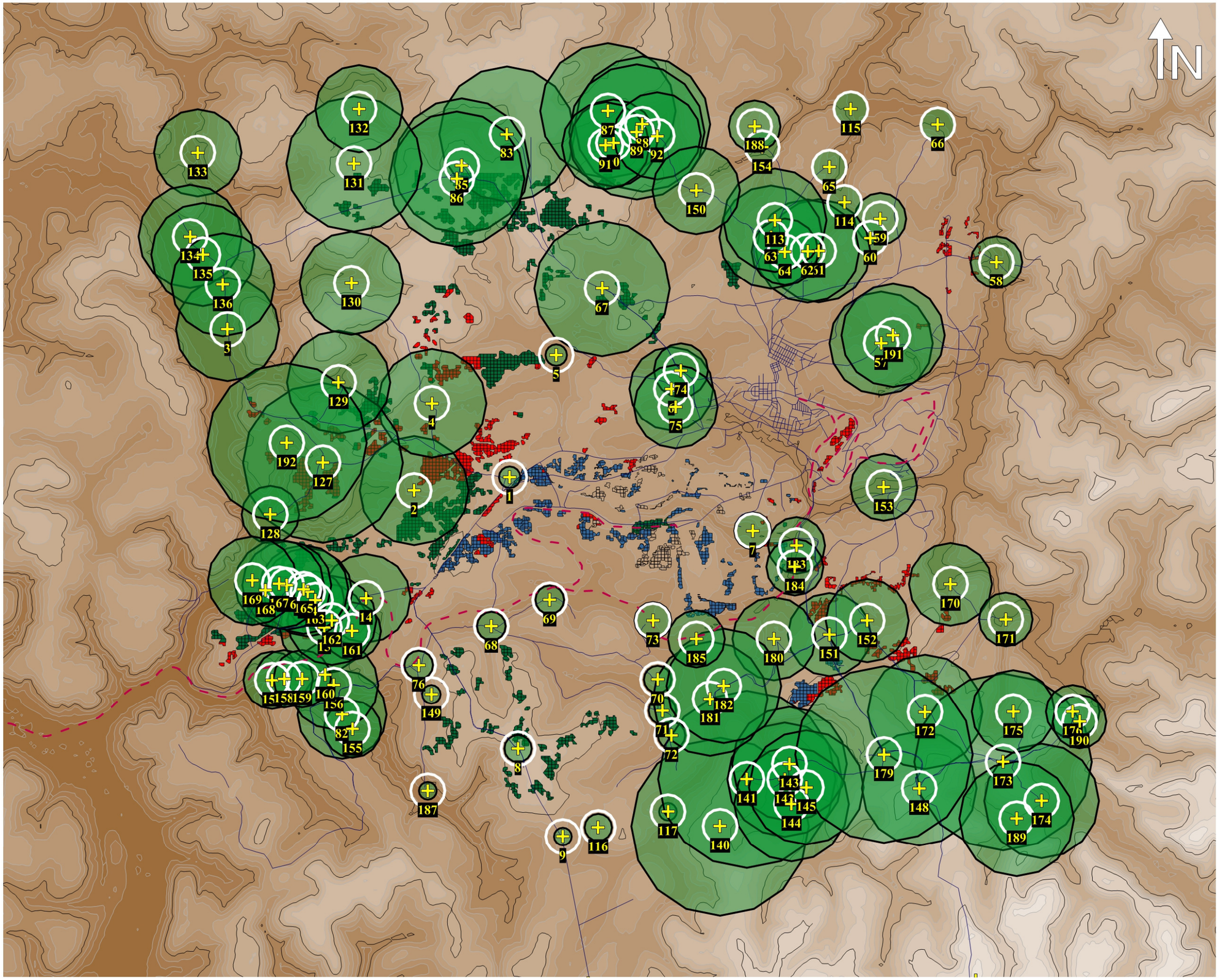
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤3 dB Increment (Day) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.1
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 3 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

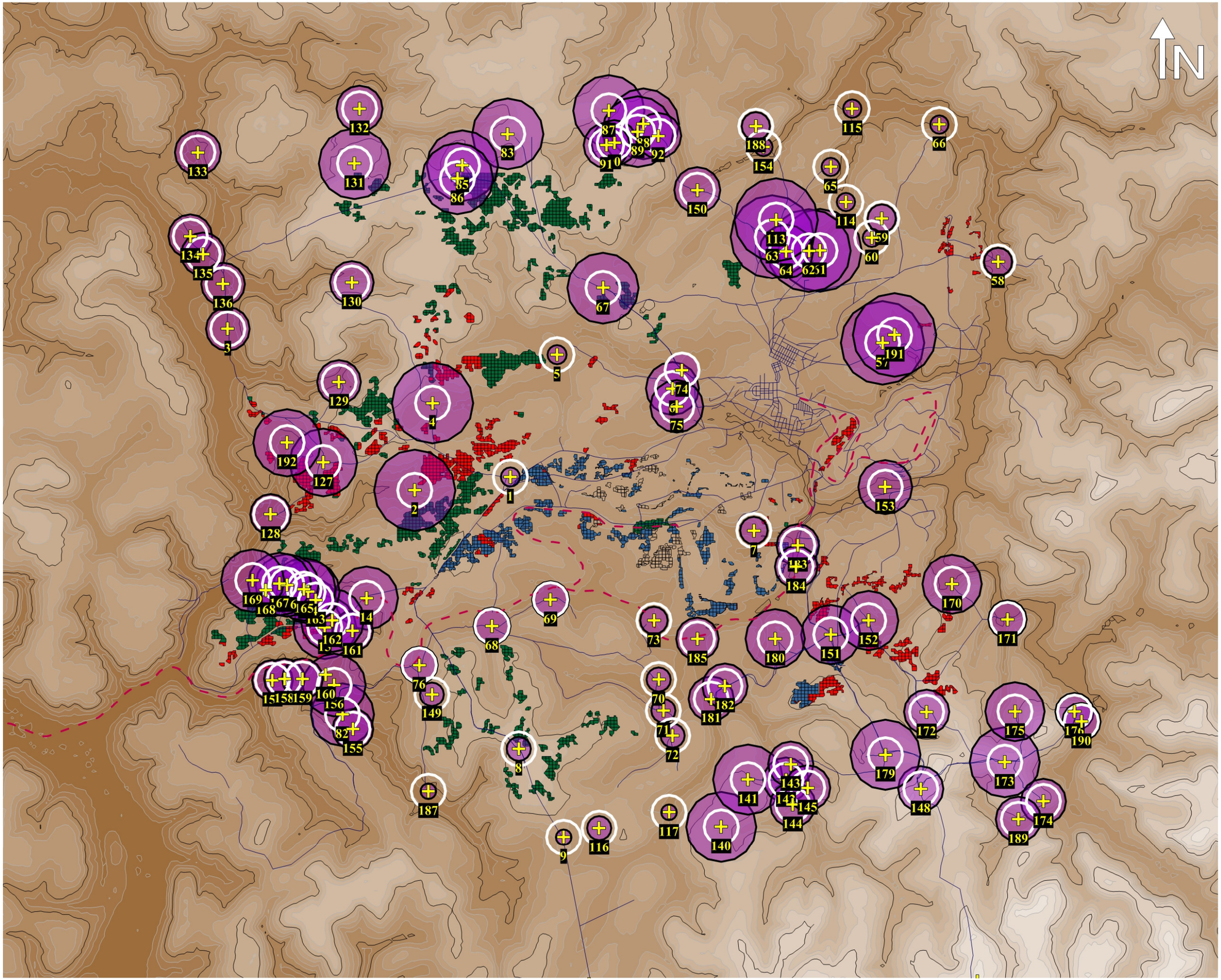
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤3 dB Increment (Night) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.2
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 5 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

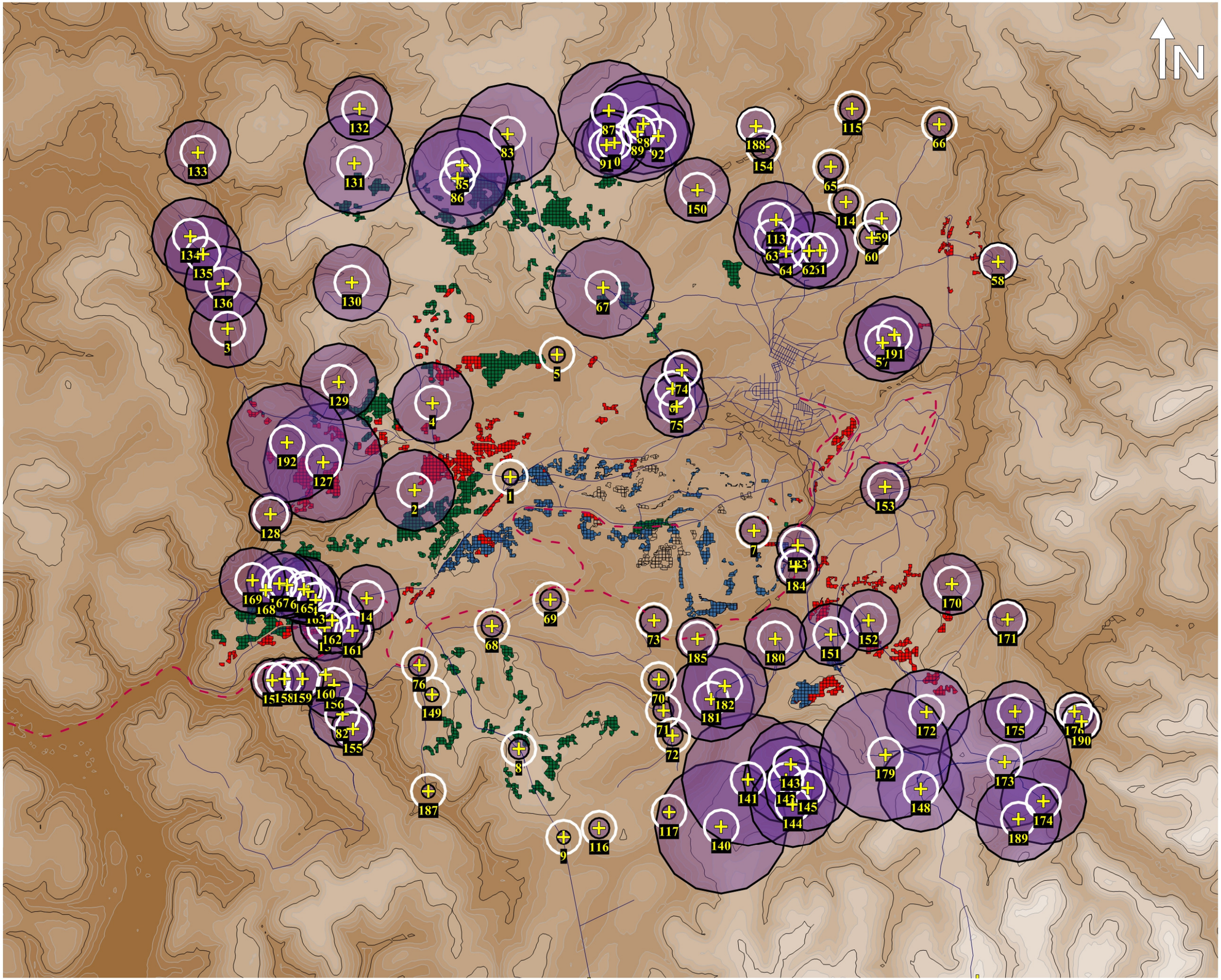
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤5 dB Increment (Day) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.3
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 5 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

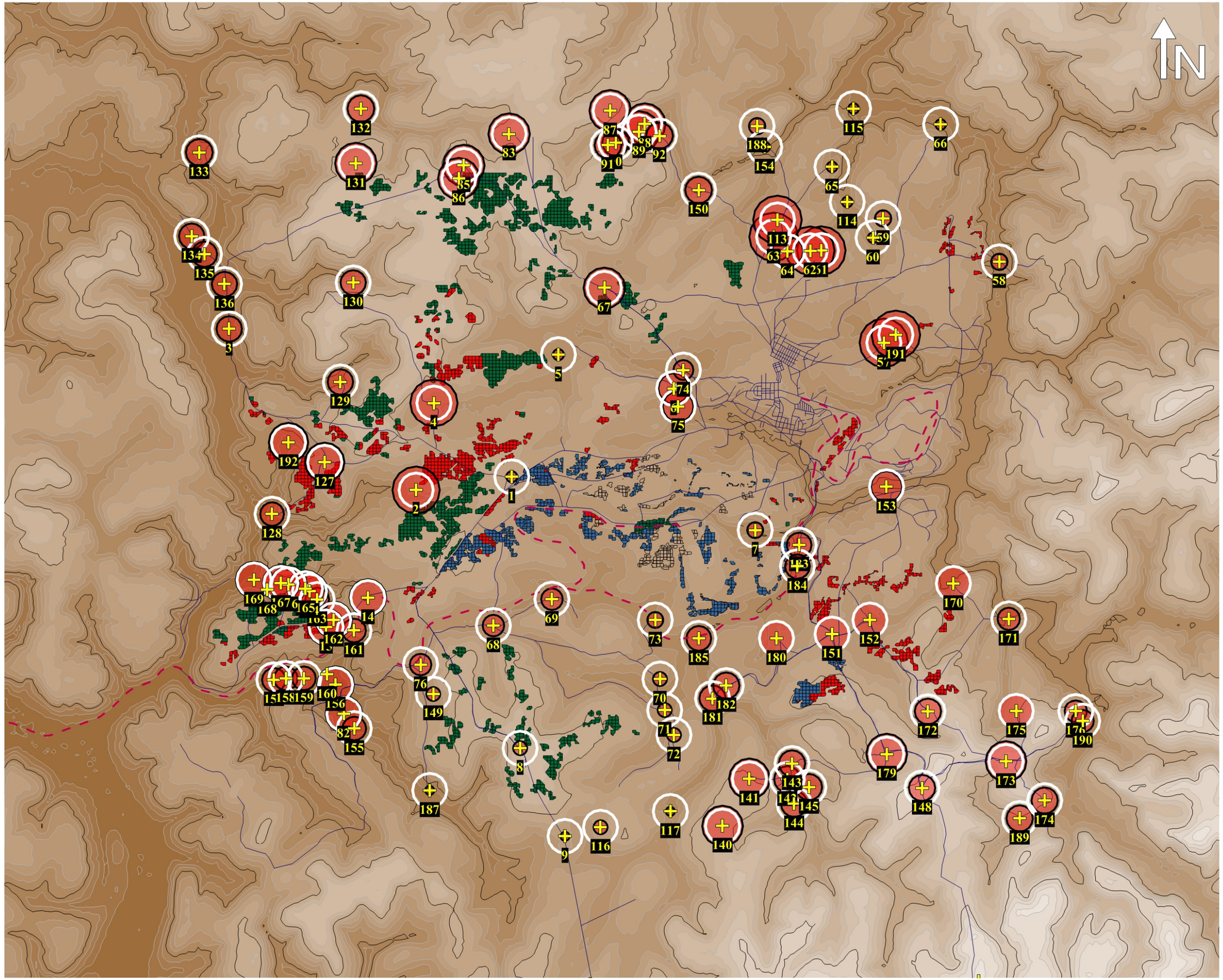
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤5 dB Increment (Night) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.4
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 10 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

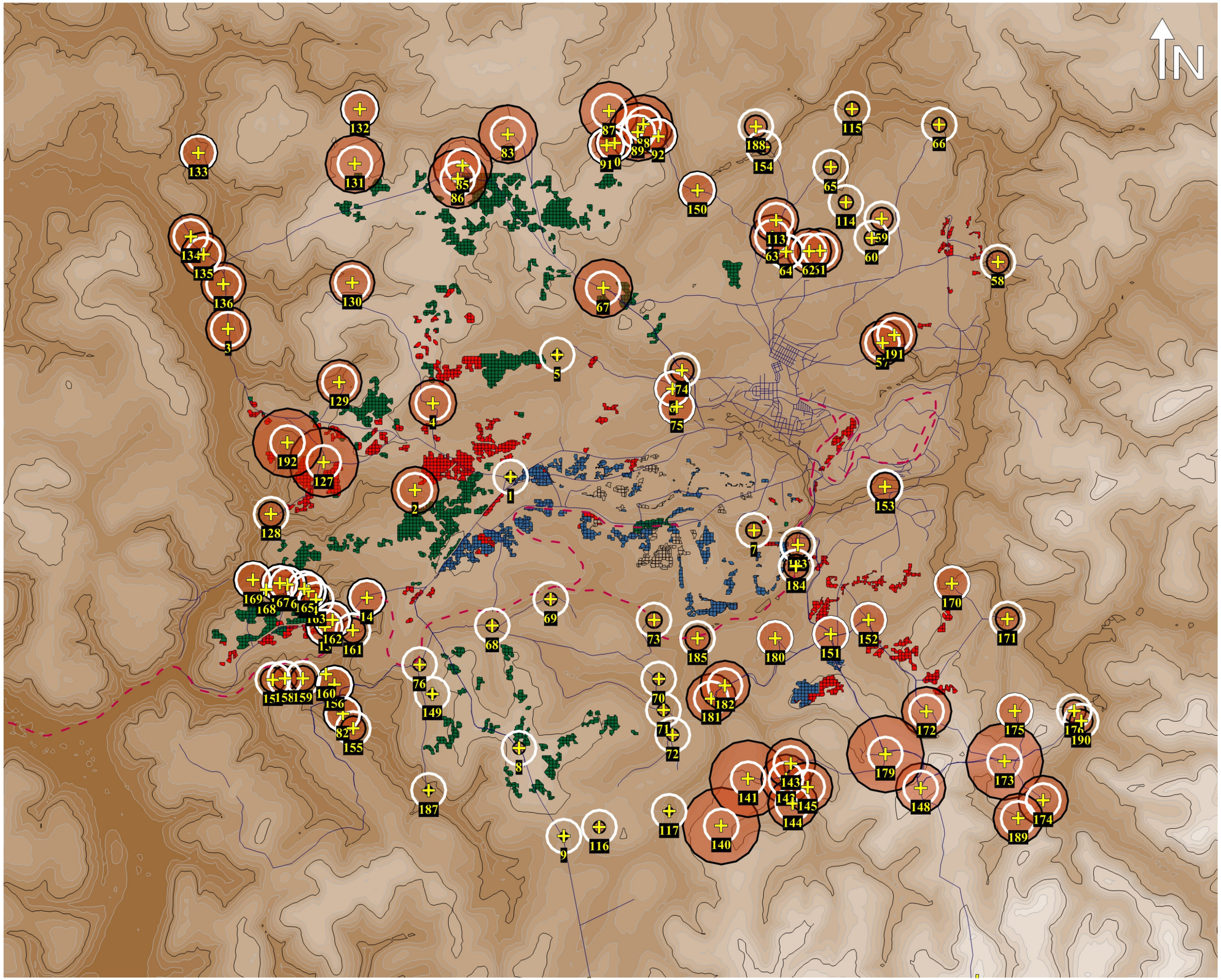
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤10 dB Increment (Day) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.5
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 10 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

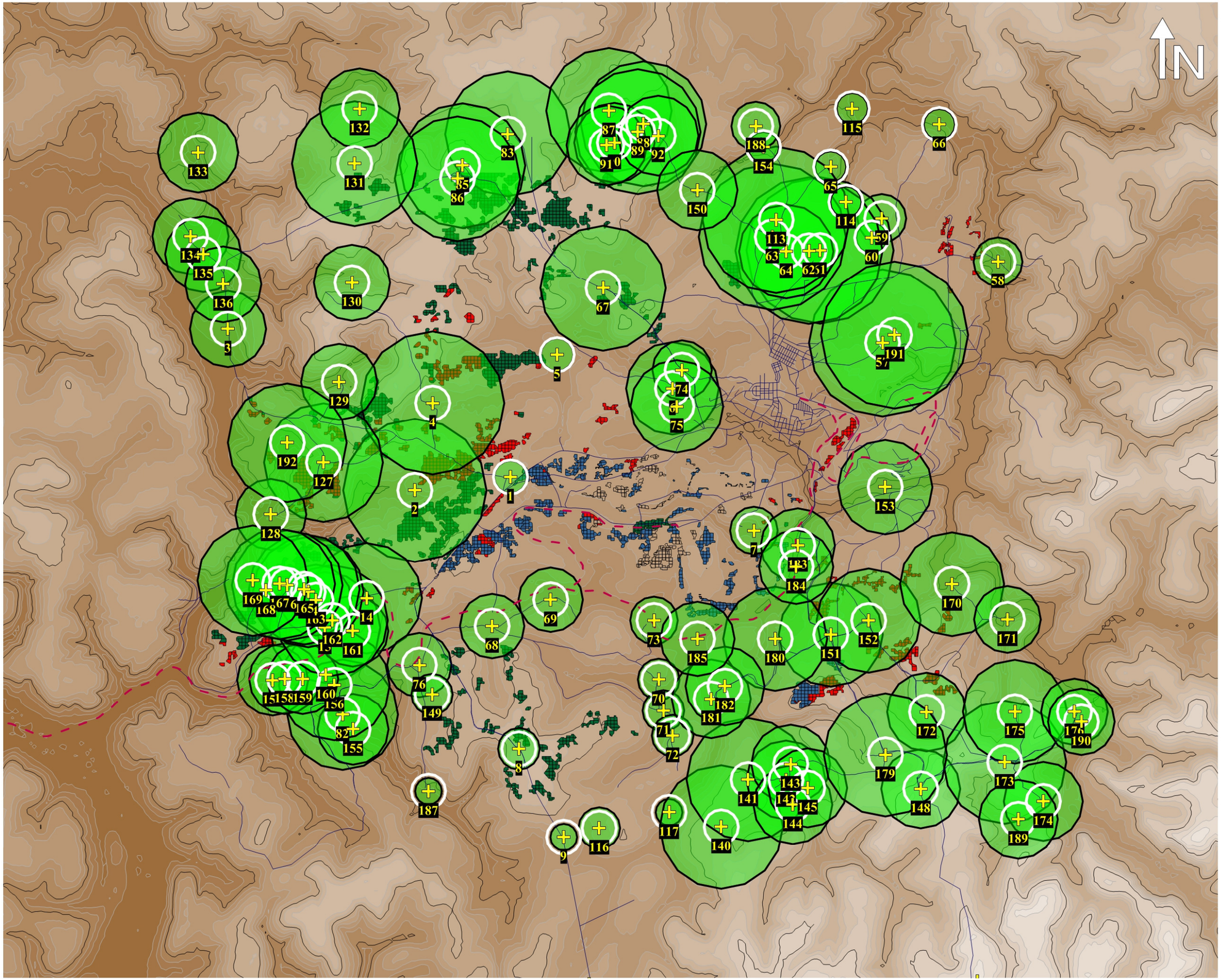
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤10 dB Increment (Night) [1 Working Area]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.6
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 3 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

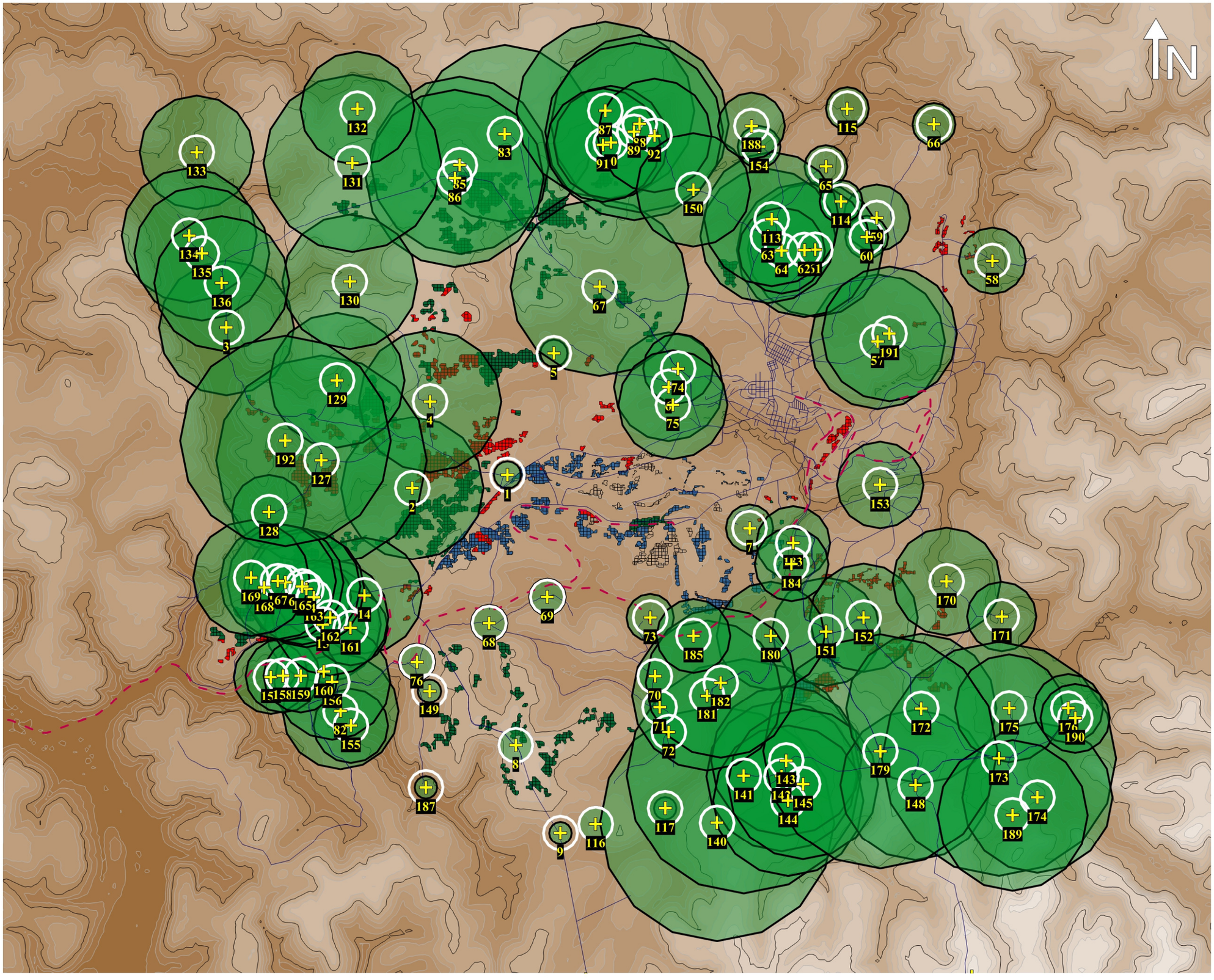
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤3 dB Increment (Day) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F-7
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 3 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

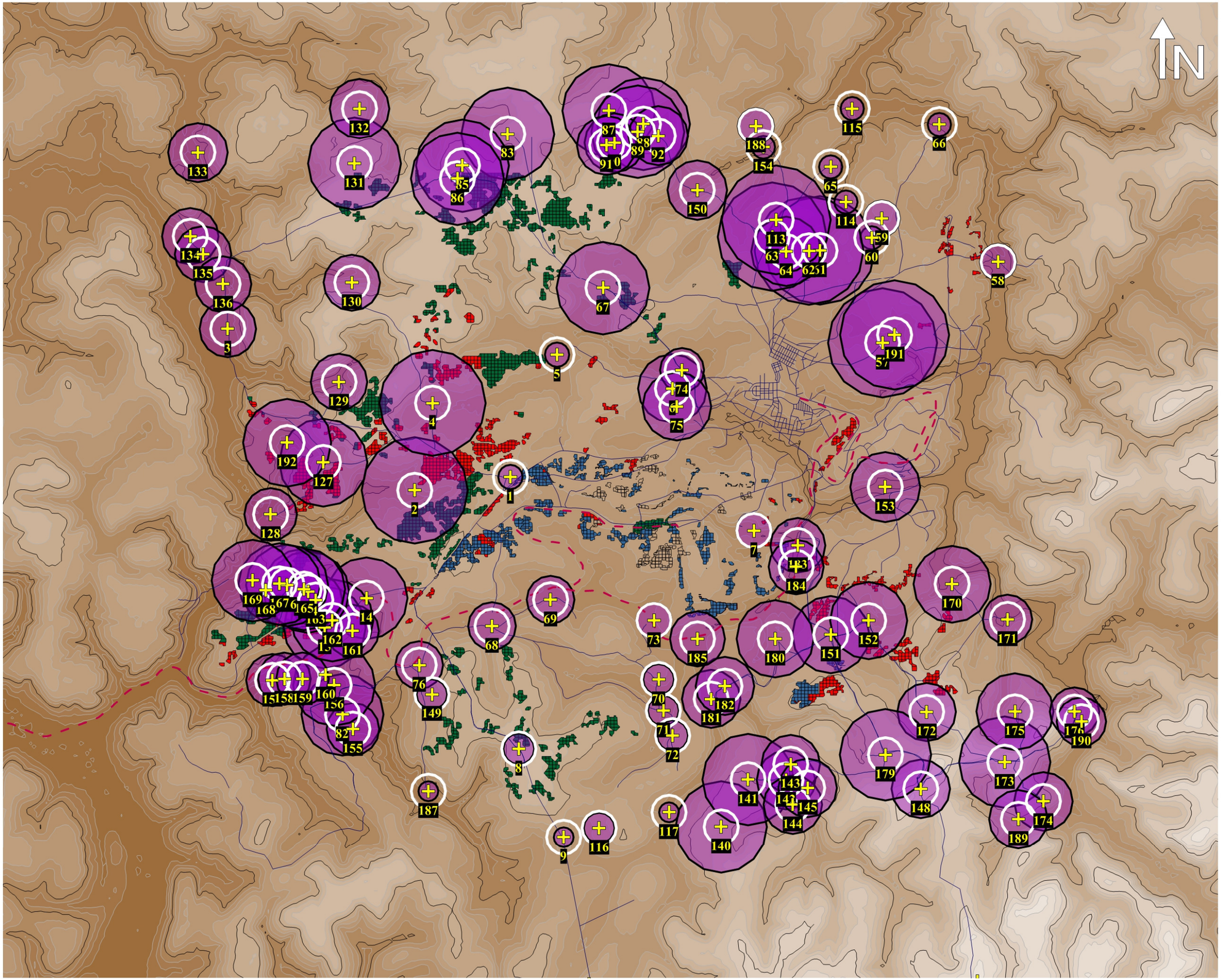
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤3 dB Increment (Night) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.8
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 5 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

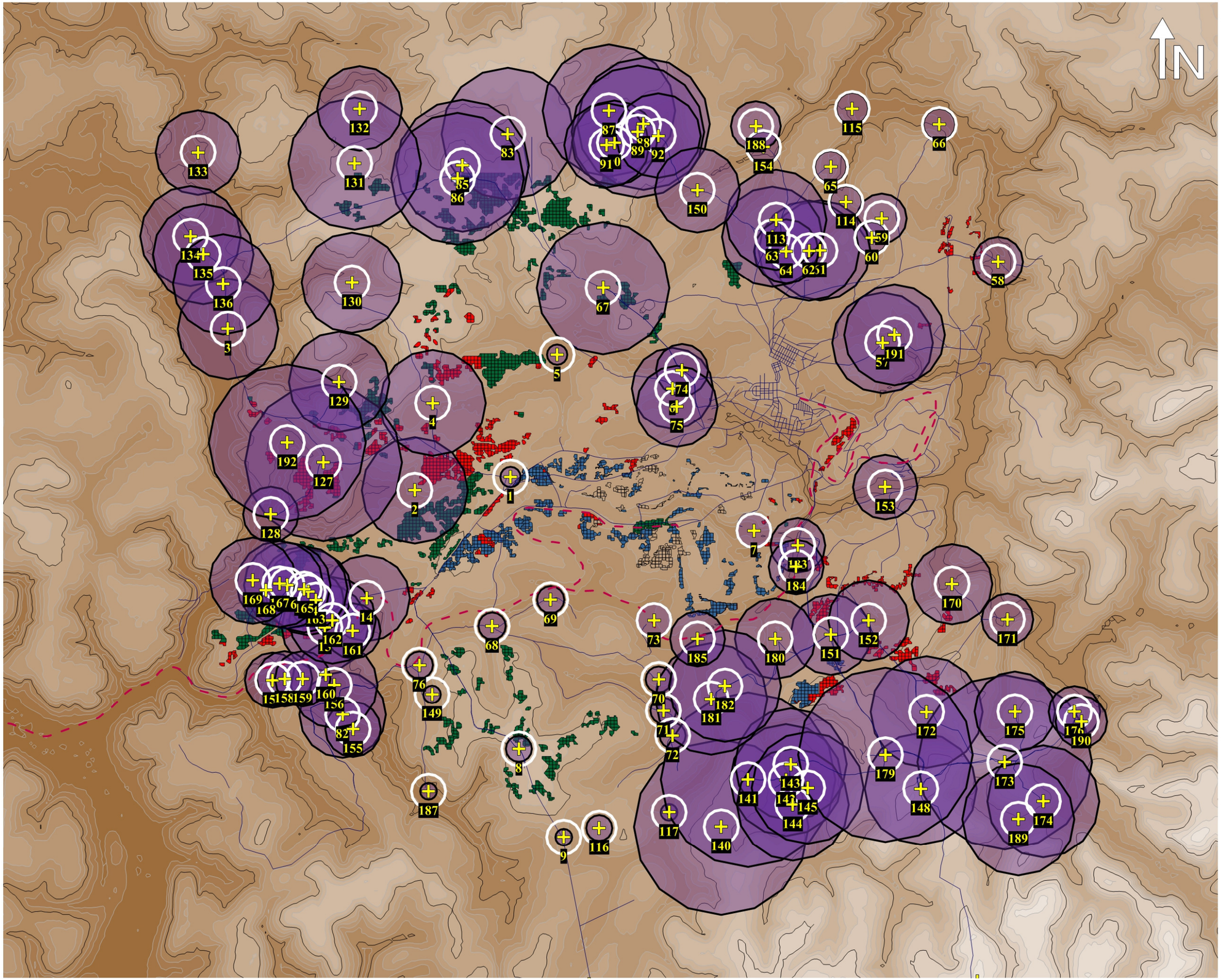
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤5 dB Increment (Day) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.9
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 5 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

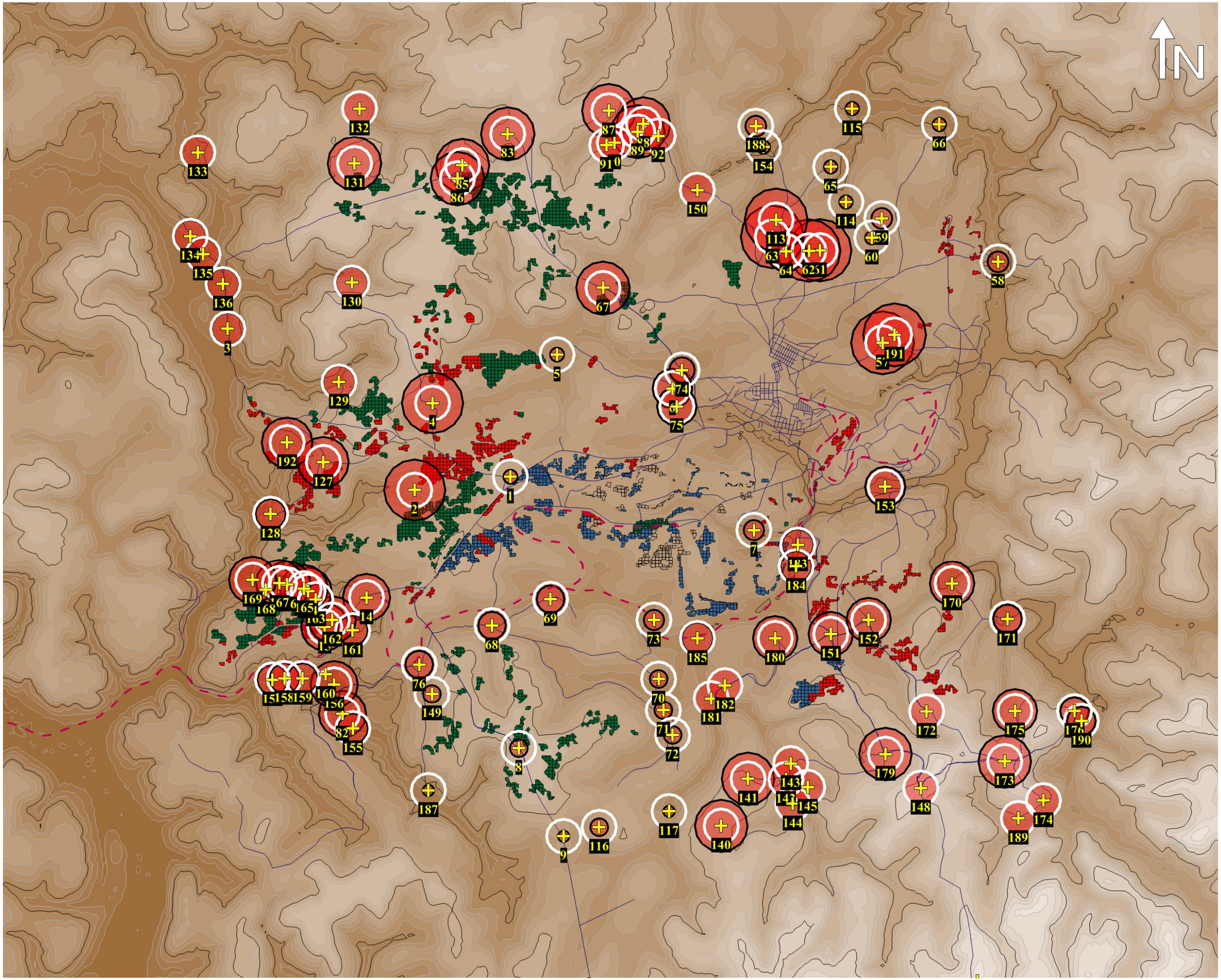
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤5 dB Increment (Night) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F-10
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 10 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

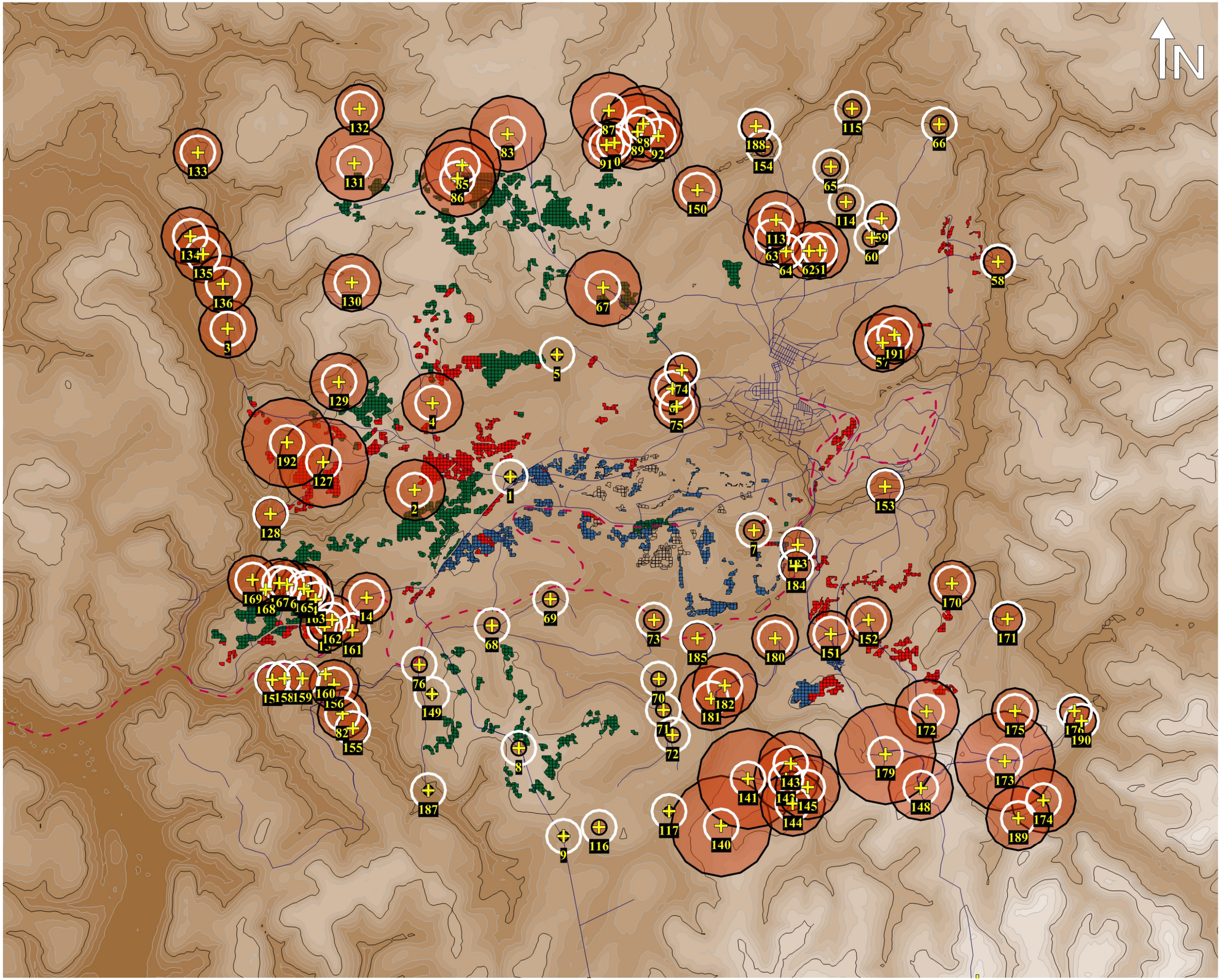
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤10 dB Increment (Day) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.11
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 10 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

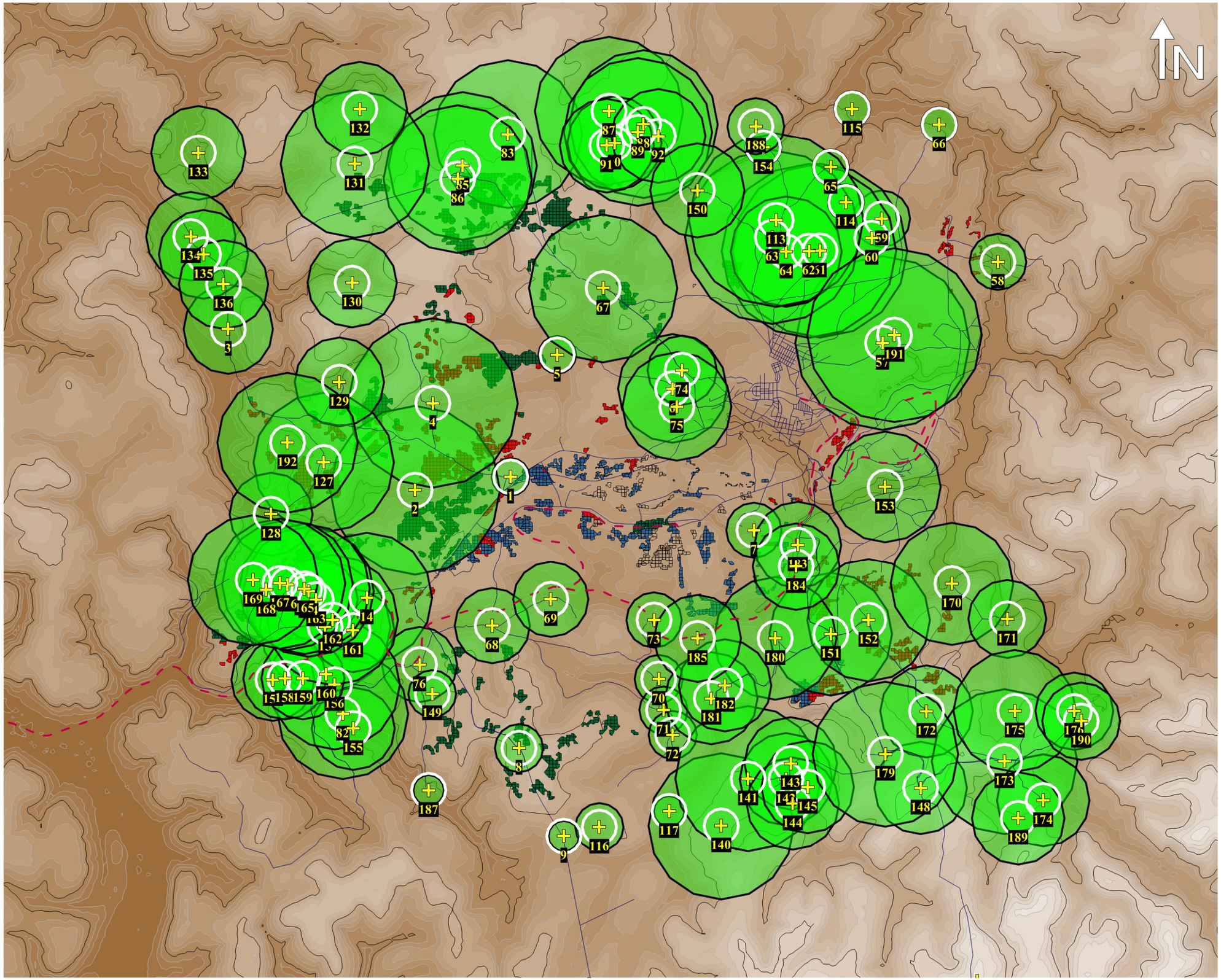
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤10 dB Increment (Night) [2 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.12
Date: Sept. 2014	**Project Number:** 350854	



LEGEND:

- Village location
- 500 m setback
- 3 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

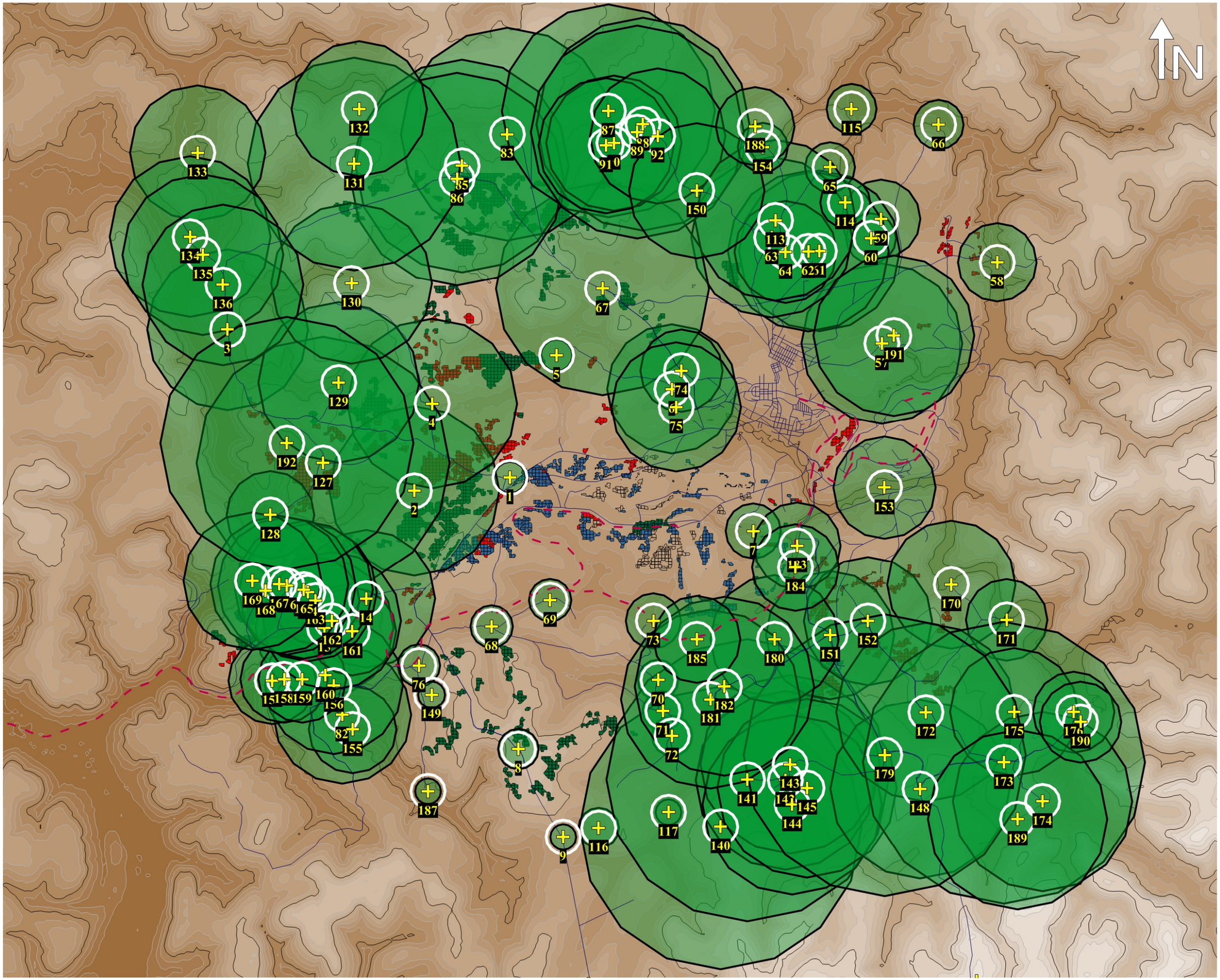
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤3 dB Increment (Day) [3 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.13
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 3 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

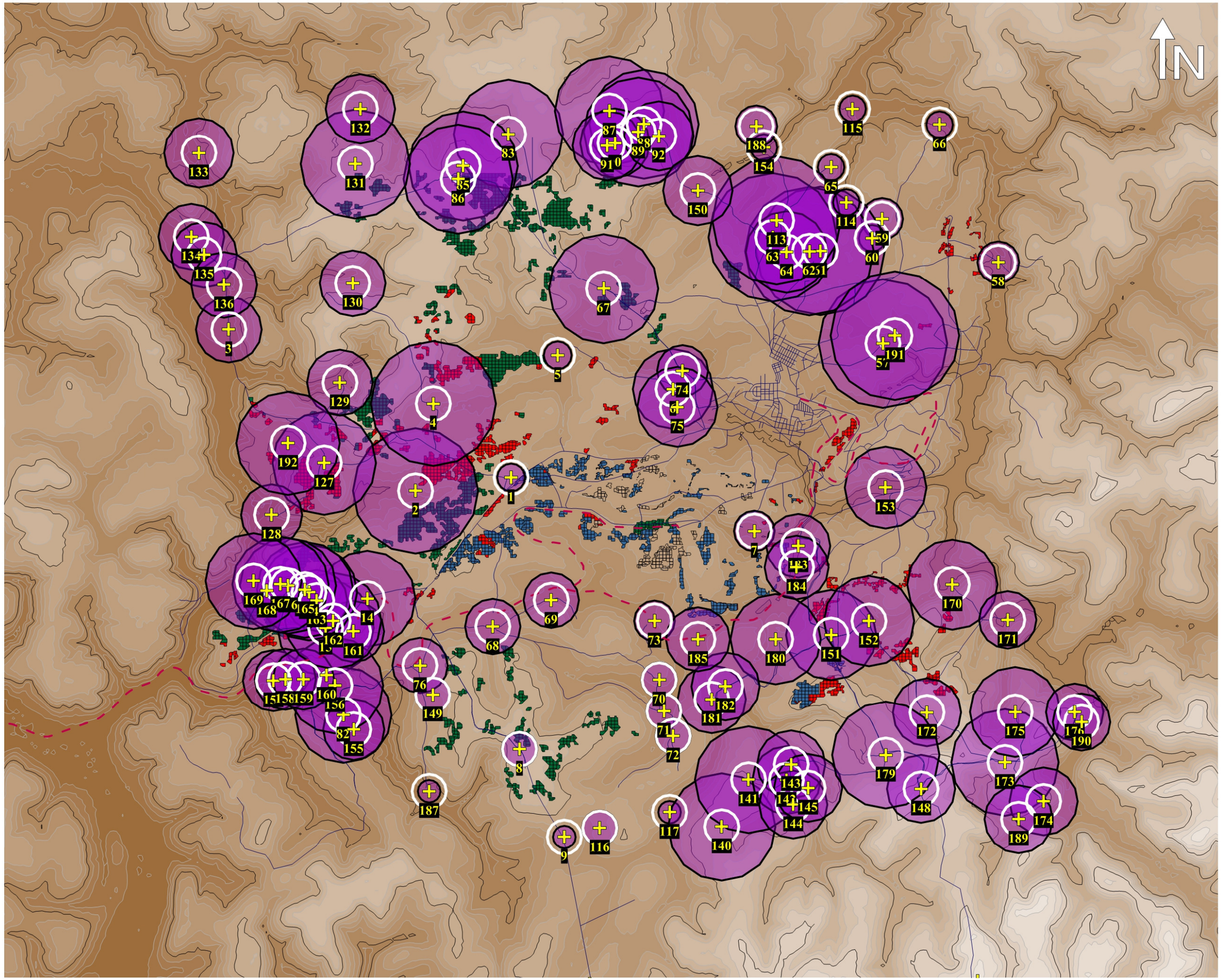
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤3 dB Increment (Night) [3 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.14
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 5 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

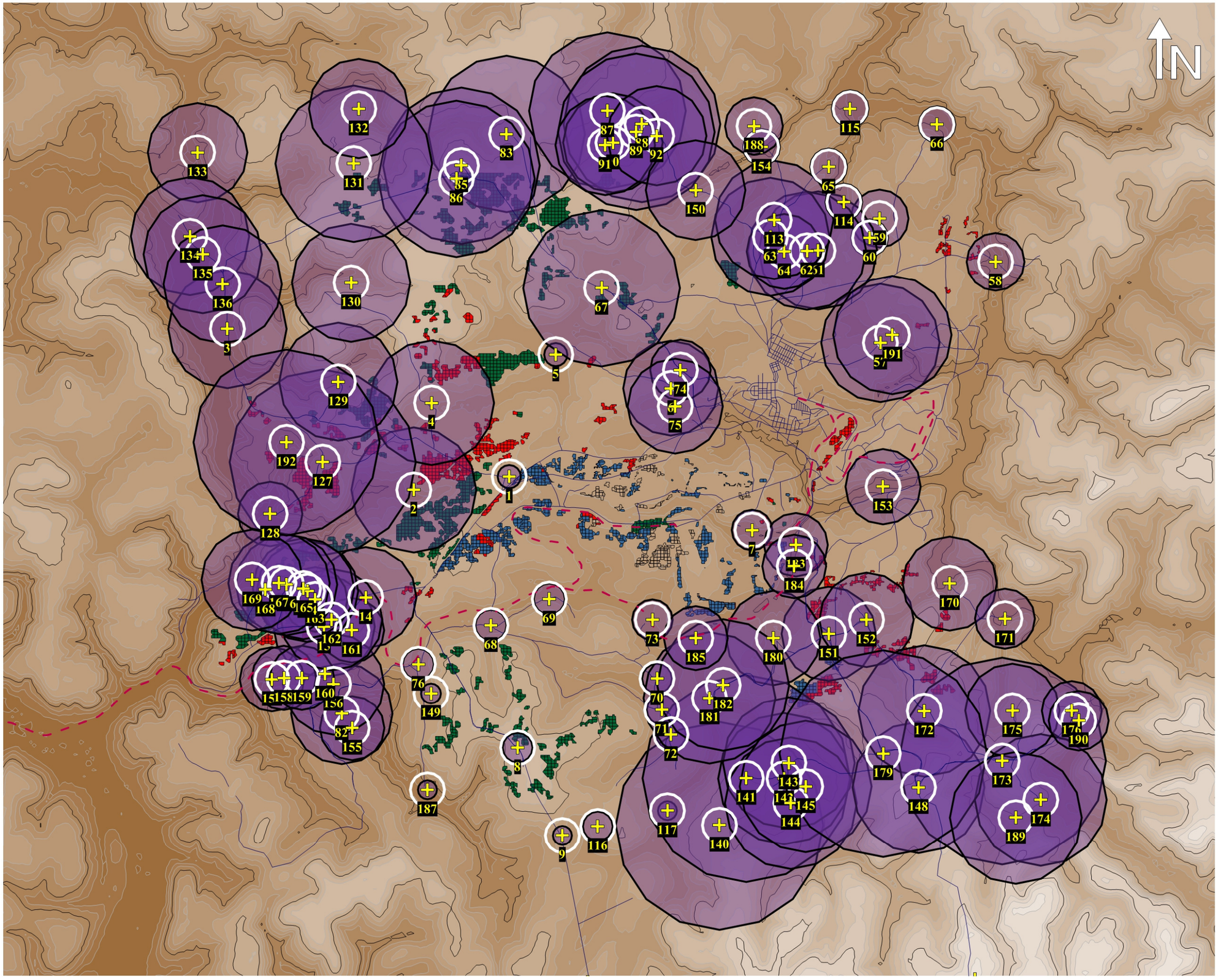
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤5 dB Increment (Day) [3 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.15
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 5 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

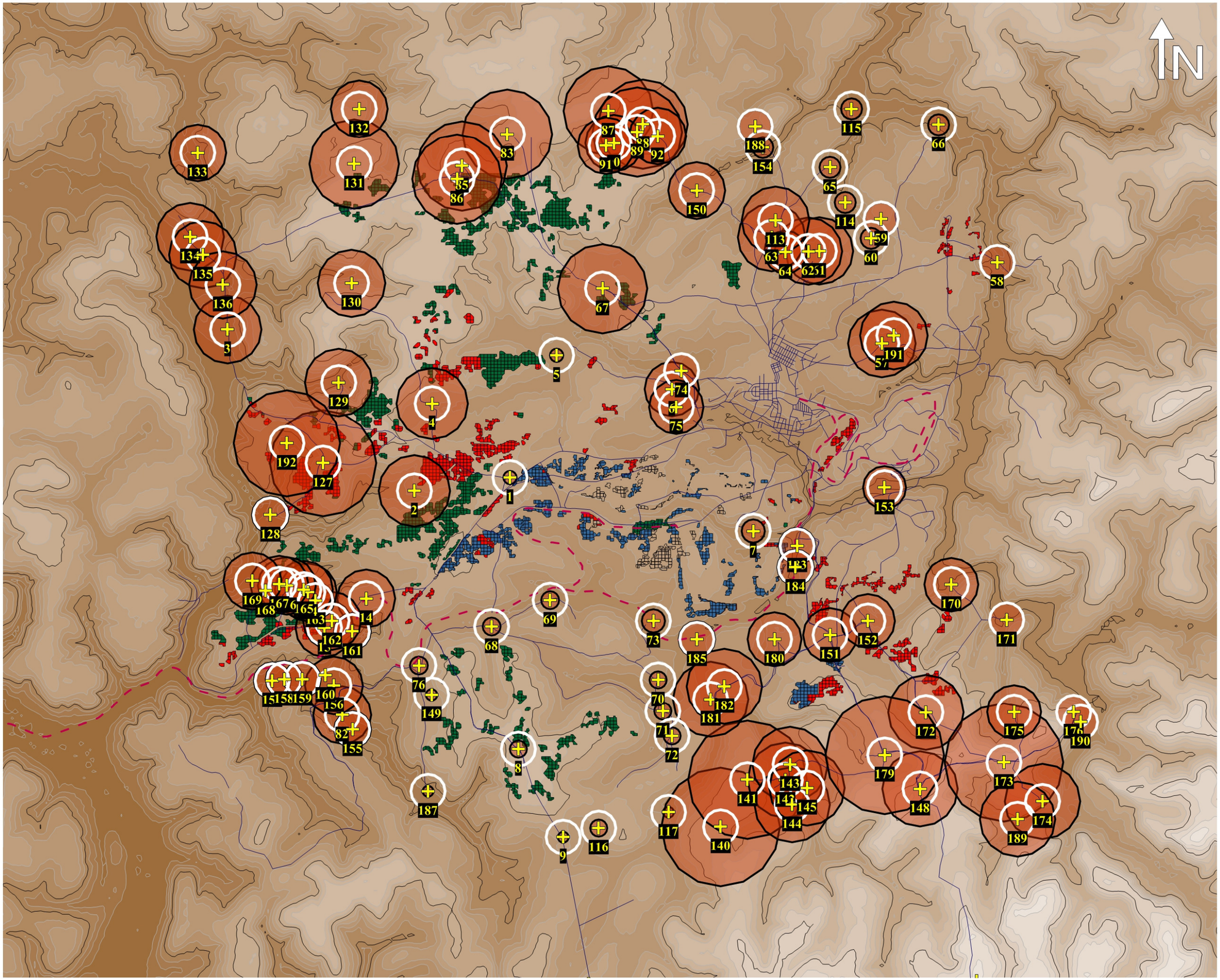
SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤5 dB Increment (Night) [3 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.16
Date: Sept. 2014	Project Number: 350854	



LEGEND:

- Village location
- 500 m setback
- 10 dB increment setback
- Road
- Rail
- Existing mine area
- 18.5 MTPA mine area
- 22.5 MTPA mine area
- 27.5 MTPA mine area

NOTES:

SCALE:

0 m — 3,000 m — 6,000 m

REVISIONS:

No.	Date	By	Revisions

REFERENCE:

SENES Consultants
AN ARCADIS COMPANY

Compagnie des bauxites de Guinée

Village Setbacks Required for ≤10 dB Increment (Night) [3 Working Areas]

Sangarédi, Guinea

Drawn By:	Approved By:	Figure No.:
NZS	JLK	F.18
Date: Sept. 2014	Project Number: 350854	

ANNEX G:

SANGARÉDI MINING REGION – CALCULATIONS

Table G.1: Separation Distances for 1 Working Area

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
1	Hamdalaye	1	Y	185	53.1	55.1	61.1	61.8	62.1	8.7	7.0	468	313	374	314	278	234	162	136
2	Fassely Fouta Bé	1	Y	204	36.5	36.5	60.0	60.0	60.0	23.5	23.5	1,590	1,590	1,593	1,593	1,187	1,187	691	691
3	Boulleré	1	N	2,072	38.6	32.1	28.5	39.0	33.7	0.4	1.6	855	1,509	857	1,512	638	1,126	372	656
4	Mbouroré	1	Y	585	36.5	36.5	47.9	48.2	48.2	11.7	11.7	1,590	1,590	1,593	1,593	1,187	1,187	691	691
5	Paragogo	1	Y	374	53.1	55.1	53.1	56.1	57.2	3.0	2.1	468	313	374	314	278	234	162	136
6	Ndantary	1	Y	1,420	41.4	39.5	37.8	43.0	41.7	1.6	2.2	1,036	1,224	1,038	1,226	774	913	450	532
7	Boundou Wandé	1	N	336	43.9	43.9	49.3	50.4	50.4	6.5	6.5	538	863	539	539	402	402	234	234
8	Kagnéka	1	Y	172	50.4	52.3	61.9	62.2	62.4	11.8	10.1	472	400	473	401	352	299	205	174
9	Sintiourou Kaouri Bowé	1	N	1,144	50.4	52.3	35.3	50.5	52.4	0.1	0.1	305	258	306	259	228	193	133	112
14	Madina Kankalaré	1	Y	1,068	39.4	38.8	41.1	43.3	43.1	3.9	4.3	1,234	1,301	1,236	1,303	921	971	536	565
15	Kankalaré	1	Y	191	39.4	38.8	60.8	60.8	60.8	21.4	22.0	1,234	1,301	1,236	1,303	921	971	536	565
57	Ndanta Fongné Dow	1	Y	1,135	36.2	37.1	40.4	41.8	42.0	5.6	4.9	1,632	1,509	1,635	1,512	1,218	1,126	709	656
58	Cogon Lengué	1	Y	485	48.6	45.0	50.1	52.4	51.3	3.8	6.3	553	757	554	758	412	565	240	329
59	Sambou1	1	Y	1,778	48.6	45.0	35.2	48.8	45.4	0.2	0.4	553	757	554	758	412	565	240	329
60	Sambou2	1	N	1,983	48.6	45.0	29.0	48.6	45.1	0.0	0.1	357	489	358	490	267	365	155	212
61	Hore Sella1	1	Y	2,314	36.2	37.1	32.2	37.7	38.3	1.5	1.2	1,632	1,509	1,635	1,512	1,218	1,126	709	656
62	Hore Sella2	1	Y	1,995	36.2	37.1	33.9	38.2	38.8	2.0	1.7	1,632	1,509	1,635	1,512	1,218	1,126	709	656
63	Daba Dow	1	Y	1,174	36.2	37.1	40.0	41.5	41.8	5.3	4.7	1,632	1,509	1,635	1,512	1,218	1,126	709	656
64	Hore Sella 3	1	N	1,341	36.2	37.1	33.4	38.0	38.7	1.8	1.6	1,055	975	1,057	977	787	728	458	424
65	Sella Roundé	1	N	3,828	48.6	45.0	21.4	48.6	45.0	0.0	0.0	357	489	358	490	267	365	155	212
66	Passago	1	N	2,770	48.6	45.0	25.1	48.6	45.0	0.0	0.0	357	489	358	490	267	365	155	212
67	Parawol Aliou	1	Y	183	38.0	34.0	61.2	61.2	61.2	23.2	27.2	1,395	1,978	1,397	1,982	1,041	1,476	606	860
68	Hore Lafou	1	Y	627	45.5	51.8	47.2	49.4	53.1	3.9	1.3	724	418	726	419	541	312	315	182
69	Lafou Mbayla	1	Y	1,645	45.5	51.8	36.1	46.0	51.9	0.5	0.1	724	418	726	419	541	312	315	182
70	Hafia1	1	Y	1,655	50.4	52.3	36.0	50.6	52.4	0.2	0.1	472	400	473	401	352	299	205	174
71	Ndiarindé Roundé	1	Y	1,003	50.4	52.3	41.8	51.0	52.7	0.6	0.4	472	400	473	401	352	299	205	174
72	Ndiarindé Missidé	1	Y	1,024	50.4	52.3	41.5	50.9	52.6	0.5	0.3	472	400	473	401	352	299	205	174
73	Sintiourou Hafia	1	N	1,007	43.9	43.9	36.7	44.7	44.7	0.8	0.8	538	538	539	539	402	402	234	234
74	Koungnoubé	1	N	1,114	41.4	39.5	35.6	42.4	41.0	1.0	1.5	670	791	671	792	500	590	291	344
75	Sintiourou Baladaroul	1	Y	1,740	41.4	39.5	35.5	42.4	40.9	1.0	1.4	1,036	1,224	1,038	1,226	774	913	450	532
76	Parawol Malassi	1	Y	700	45.5	51.8	45.9	48.7	52.8	3.2	1.0	724	418	726	419	541	312	315	182
82	Kalinko Guessoré	1	Y	2,444	39.4	38.8	31.6	40.1	39.6	0.7	0.8	1,234	1,301	1,236	1,303	921	971	536	565
83	Kahel Mbody	1	Y	1,166	38.0	34.0	40.0	42.2	41.0	4.2	7.0	1,395	1,978	1,397	1,982	1,041	1,476	606	860
85	Kourawel	1	Y	232	38.0	34.0	58.5	58.6	58.5	20.6	24.5	1,395	1,978	1,397	1,982	1,041	1,476	606	860
86	Sintiourou Kourawel	1	Y	34	38.0	34.0	80.4	80.4	80.4	42.4	46.4	1,395	1,978	1,397	1,982	1,041	1,476	606	860
87	Nyalé Dja´man	1	Y	1,874	38.0	34.0	34.6	39.6	37.3	1.6	3.3	1,395	1,978	1,397	1,982	1,041	1,476	606	860
88	Nyalé Moussa	1	Y	1,741	38.0	34.0	35.5	39.9	37.8	1.9	3.8	1,395	1,978	1,397	1,982	1,041	1,476	606	860

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
89	Nyalé Hogo	1	Y	1,459	38.0	34.0	37.5	40.8	39.1	2.8	5.1	1,395	1,978	1,397	1,982	1,041	1,476	606	860
90	Nyalé Boussoura	1	N	928	38.0	34.0	37.7	40.8	39.2	2.8	5.2	901	1,278	903	1,280	673	954	392	555
91	Sintiourou Boussoura	1	N	851	38.0	34.0	38.7	41.3	39.9	3.3	5.9	901	1,278	903	1,280	673	954	392	555
92	Nyalé Missidé	1	N	1,780	38.0	34.0	30.2	38.7	35.5	0.7	1.5	901	1,278	903	1,280	673	954	392	555
113	Daba Ley	1	Y	1,630	36.2	37.1	36.2	39.2	39.7	3.0	2.6	1,632	1,509	1,635	1,512	1,218	1,126	709	656
114	Sellawol	1	N	2,914	48.6	45.0	24.6	48.6	45.0	0.0	0.0	357	489	358	490	267	365	155	212
115	Doumoun Cogon	1	N	4,240	48.6	45.0	20.3	48.6	45.0	0.0	0.0	357	489	358	490	267	365	155	212
116	Lougal	1	Y	1,579	50.4	52.3	36.6	50.6	52.4	0.2	0.1	472	400	473	401	352	299	205	174
117	Djoloun	1	N	2,439	50.4	52.3	26.6	50.4	52.3	0.0	0.0	305	258	306	259	228	193	133	112
127	Guegueré	1	Y	246	38.6	32.1	57.9	57.9	57.9	19.3	25.8	1,324	2,335	1,326	2,339	988	1,743	575	1,015
128	Fassely Belenderé	1	N	485	39.4	38.8	45.1	46.1	46.0	6.7	7.2	798	840	799	842	595	627	347	365
129	Bandodji Touguidjé	1	N	549	38.6	32.1	43.7	44.8	44.0	6.2	11.9	855	1,509	857	1,512	638	1,126	372	656
130	Bandodji Nyalbi	1	N	1,832	38.6	32.1	29.9	39.1	34.1	0.5	2.0	855	1,509	857	1,512	638	1,126	372	656
131	Daara	1	Y	298	38.0	34.0	55.7	55.7	55.7	17.7	21.7	1,395	1,978	1,397	1,982	1,041	1,476	606	860
132	Bosseré	1	N	1,915	38.0	34.0	29.4	38.6	35.3	0.6	1.3	901	1,278	903	1,280	673	954	392	555
133	Boundi Foulasso	1	N	4,285	38.0	34.0	20.1	38.1	34.2	0.1	0.2	901	1,278	903	1,280	673	954	392	555
134	Feto Kewewol	1	N	4,317	38.6	32.1	20.1	38.7	32.4	0.1	0.3	855	1,509	857	1,512	638	1,126	372	656
135	Pomboniwol	1	N	4,108	38.6	32.1	20.6	38.7	32.4	0.1	0.3	855	1,509	857	1,512	638	1,126	372	656
136	Sintiourou Nalbewou	1	N	4,005	38.6	32.1	20.9	38.7	32.4	0.1	0.3	855	1,509	857	1,512	638	1,126	372	656
140	Wendou Baga	1	Y	3,638	38.2	30.9	27.0	38.5	32.4	0.3	1.5	1,371	2,593	1,373	2,598	1,023	1,936	596	1,127
141	Pétoum Nyalbi	1	Y	2,569	38.2	30.9	31.0	39.0	34.0	0.8	3.1	1,371	2,593	1,373	2,598	1,023	1,936	596	1,127
142	Pora Hodho	1	N	2,165	38.2	30.9	28.0	38.6	32.7	0.4	1.8	886	1,676	887	1,679	661	1,251	385	728
143	Sintiourou Thiéweré	1	N	1,684	38.2	30.9	30.8	38.9	33.9	0.7	3.0	886	1,676	887	1,679	661	1,251	385	728
144	Sintiourou Sa´kou Timbi	1	N	2,849	38.2	30.9	24.8	38.4	31.9	0.2	1.0	886	1,676	887	1,679	661	1,251	385	728
145	Pora Banla	1	N	2,363	38.2	30.9	27.0	38.5	32.4	0.3	1.5	886	1,676	887	1,679	661	1,251	385	728
148	Diandian	1	N	2,800	38.2	30.9	25.0	38.4	31.9	0.2	1.0	886	1,676	887	1,679	661	1,251	385	728
149	Parawol Kouradjé	1	N	765	45.5	51.8	39.9	46.6	52.1	1.1	0.3	468	270	469	270	349	202	203	117
150	Sintiourou Hakoundethiangui	1	N	2,226	38.0	34.0	27.6	38.4	34.9	0.4	0.9	901	1,278	903	1,280	673	954	392	555
151	Carrefour Parawol	1	Y	486	40.1	39.6	50.1	50.5	50.4	10.4	10.8	1,161	1,213	1,163	1,215	867	905	505	527
152	Madina Dian	1	Y	776	40.1	39.6	44.7	46.0	45.9	5.9	6.3	1,161	1,213	1,163	1,215	867	905	505	527
153	Sintiourou Nyaka	1	N	1,755	36.2	37.1	30.4	37.2	37.9	1.0	0.8	1,055	975	1,057	977	787	728	458	424
154	Thiaghé	1	N	3,454	48.6	45.0	22.6	48.6	45.0	0.0	0.0	357	489	358	490	267	365	155	212
155	Kalinko Pouta´	1	N	2,138	39.4	38.8	28.1	39.7	39.2	0.3	0.4	798	840	799	842	595	627	347	365
156	Nyangaba	1	Y	1,570	39.4	38.8	36.6	41.2	40.9	1.8	2.1	1,234	1,301	1,236	1,303	921	971	536	565
157	Kalinko Ley	1	N	1,037	39.4	38.8	36.4	41.2	40.8	1.8	2.0	798	840	799	842	595	627	347	365
158	Kalinko Ley 2	1	N	1,052	39.4	38.8	36.2	41.1	40.7	1.7	1.9	798	840	799	842	595	627	347	365
159	Sintiourou Madina	1	N	1,189	39.4	38.8	34.8	40.7	40.3	1.3	1.5	798	840	799	842	595	627	347	365

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
161	Telli Bofi	1	N	989	39.4	38.8	36.9	41.4	41.0	2.0	2.2	798	840	799	842	595	627	347	365
162	Kankalaré Hacoudé	1	Y	353	39.4	38.8	53.7	53.9	53.9	14.5	15.1	1,234	1,301	1,236	1,303	921	971	536	565
163	Parawi Saleah 1	1	N	312	39.4	38.8	50.1	50.5	50.4	11.1	11.6	798	840	799	842	595	627	347	365
164	Parawi Saleah 2	1	Y	381	39.4	38.8	52.8	53.0	53.0	13.6	14.2	1,234	1,301	1,236	1,303	921	971	536	565
165	Parawi Saleah 3	1	Y	435	39.4	38.8	51.3	51.6	51.6	12.2	12.8	1,234	1,301	1,236	1,303	921	971	536	565
166	Parawi	1	Y	303	39.4	38.8	55.5	55.6	55.6	16.2	16.8	1,234	1,301	1,236	1,303	921	971	536	565
167	Feto Parawi 2	1	Y	316	39.4	38.8	55.0	55.1	55.1	15.7	16.3	1,234	1,301	1,236	1,303	921	971	536	565
169	Feto Parawi 1	1	Y	637	39.4	38.8	47.0	47.7	47.6	8.3	8.8	1,234	1,301	1,236	1,303	921	971	536	565
170	Bourreti	1	Y	817	40.1	39.6	44.1	45.6	45.4	5.5	5.8	1,161	1,213	1,163	1,215	867	905	505	527
171	Ndantari	1	N	1,627	40.1	39.6	31.2	40.6	40.2	0.5	0.6	750	784	752	785	560	585	326	341
172	Sitako	1	N	591	38.2	30.9	42.8	44.1	43.1	5.9	12.2	886	1,676	887	1,679	661	1,251	385	728
173	Sintiourou Daroul Diandian	1	Y	2,500	38.2	30.9	31.3	39.0	34.1	0.8	3.2	1,371	2,593	1,373	2,598	1,023	1,936	596	1,127
174	Kourawi	1	N	4,095	38.2	30.9	20.7	38.3	31.3	0.1	0.4	886	1,676	887	1,679	661	1,251	385	728
175	Thiankwé	1	Y	1,832	40.1	39.6	34.9	41.2	40.9	1.1	1.3	1,161	1,213	1,163	1,215	867	905	505	527
176	Toumbeta	1	N	3,531	40.1	39.6	22.4	40.2	39.7	0.1	0.1	750	784	752	785	560	585	326	341
179	Limbiko	1	Y	2,226	38.2	30.9	32.6	39.3	34.9	1.1	4.0	1,371	2,593	1,373	2,598	1,023	1,936	596	1,127
180	Karé Dabbhel	1	Y	1,156	40.1	39.6	40.2	43.1	42.9	3.0	3.3	1,161	1,213	1,163	1,215	867	905	505	527
181	Missira	1	N	2,357	38.2	30.9	27.0	38.5	32.4	0.3	1.5	886	1,676	887	1,679	661	1,251	385	728
182	Sintiourou Missira	1	N	1,997	38.2	30.9	28.9	38.7	33.0	0.5	2.1	886	1,676	887	1,679	661	1,251	385	728
183	Daroul	1	Y	286	43.9	43.9	56.1	56.4	56.4	12.5	12.5	833	1,335	835	835	622	622	362	362
184	Pora PK130	1	Y	302	43.9	43.9	55.5	55.8	55.8	11.9	11.9	833	1,335	835	835	622	622	362	362
185	Sakidjé	1	Y	660	43.9	43.9	46.6	48.4	48.4	4.5	4.5	833	1,335	835	835	622	622	362	362
187	Kalinko Roundé	1	N	1,098	50.4	52.3	35.7	50.5	52.4	0.1	0.1	305	258	306	259	228	193	133	112
188	Thiangui Bonodji	1	Y	4,039	48.6	45.0	25.8	48.6	45.1	0.0	0.1	553	757	554	758	412	565	240	329
189	Sintiourou Kerkeré	1	N	4,140	38.2	30.9	20.5	38.3	31.3	0.1	0.4	886	1,676	887	1,679	661	1,251	385	728
190	Sintiourou Toumbeta	1	N	3,783	40.1	39.6	21.6	40.2	39.7	0.1	0.1	750	784	752	785	560	585	326	341
191	Ndanta Fongné Ley	1	Y	748	36.2	37.1	45.1	45.6	45.8	9.4	8.7	1,632	1,509	1,635	1,512	1,218	1,126	709	656
192	Sintiourou Lengueré	1	Y	511	38.6	32.1	49.5	49.8	49.6	11.2	17.5	1,324	2,335	1,326	2,339	988	1,743	575	1,015

Table G.2: Separation Distances for 2 Working Areas

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
1	Hamdalaye	2	Y	185	53.1	55.1	63.8	64.1	64.3	11.0	9.2	602	400	479	401	355	297	205	171
2	Fassely Fouta Bé	2	Y	204	36.5	36.5	62.7	62.7	62.7	26.2	26.2	2,089	2,089	2,093	2,093	1,551	1,551	895	895
3	Boulleré	2	N	2,072	38.6	32.1	31.6	39.4	34.9	0.8	2.8	1,111	1,980	1,113	1,984	825	1,471	476	848
4	Mbouroré	2	Y	585	36.5	36.5	50.8	51.0	51.0	14.5	14.5	2,089	2,089	2,093	2,093	1,551	1,551	895	895
5	Paragogo	2	Y	374	53.1	55.1	55.9	57.7	58.5	4.6	3.4	602	400	479	401	355	297	205	171
6	Ndantary	2	Y	1,420	41.4	39.5	40.8	44.1	43.2	2.7	3.7	1,351	1,600	1,354	1,603	1,004	1,188	579	685
7	Boundou Wandé	2	N	336	43.9	43.9	52.1	52.7	52.7	8.8	8.8	694	1,122	695	695	515	515	297	297
8	Kagnéka	2	Y	172	50.4	52.3	64.6	64.7	64.8	14.3	12.5	607	513	608	514	451	381	260	220
9	Sintiourou Kaouri Bowé	2	N	1,144	50.4	52.3	38.3	50.7	52.5	0.3	0.2	389	329	390	330	289	244	167	141
14	Madina Kankalaré	2	Y	1,068	39.4	38.8	44.0	45.3	45.2	5.9	6.4	1,614	1,703	1,617	1,706	1,199	1,264	691	729
15	Kankalaré	2	Y	191	39.4	38.8	63.4	63.4	63.4	24.0	24.6	1,614	1,703	1,617	1,706	1,199	1,264	691	729
57	Ndanta Fongné Dow	2	Y	1,135	36.2	37.1	43.4	44.1	44.3	7.9	7.2	2,145	1,980	2,149	1,984	1,593	1,471	919	848
58	Cogon Lengué	2	Y	485	48.6	45.0	52.9	54.3	53.6	5.7	8.6	713	981	714	983	529	729	305	420
59	Sambou1	2	Y	1,778	48.6	45.0	38.3	49.0	45.8	0.4	0.8	713	981	714	983	529	729	305	420
60	Sambou2	2	N	1,983	48.6	45.0	32.1	48.7	45.2	0.1	0.2	457	629	458	630	339	467	196	270
61	Hore Sella1	2	Y	2,314	36.2	37.1	35.3	38.8	39.3	2.6	2.2	2,145	1,980	2,149	1,984	1,593	1,471	919	848
62	Hore Sella2	2	Y	1,995	36.2	37.1	37.0	39.6	40.1	3.4	3.0	2,145	1,980	2,149	1,984	1,593	1,471	919	848
63	Daba Dow	2	Y	1,174	36.2	37.1	43.0	43.8	44.0	7.6	6.9	2,145	1,980	2,149	1,984	1,593	1,471	919	848
64	Hore Sella 3	2	N	1,341	36.2	37.1	36.5	39.4	39.8	3.2	2.7	1,376	1,270	1,378	1,272	1,022	943	589	544
65	Sella Roundé	2	N	3,828	48.6	45.0	24.7	48.6	45.0	0.0	0.0	457	629	458	630	339	467	196	270
66	Passago	2	N	2,770	48.6	45.0	28.3	48.6	45.1	0.0	0.1	457	629	458	630	339	467	196	270
67	Parawol Aliou	2	Y	183	38.0	34.0	63.9	63.9	63.9	25.9	29.9	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
68	Hore Lafou	2	Y	627	45.5	51.8	50.0	51.4	54.0	5.9	2.2	939	536	940	537	697	398	402	230
69	Lafou Mbayla	2	Y	1,645	45.5	51.8	39.2	46.4	52.0	0.9	0.2	939	536	940	537	697	398	402	230
70	Hafia1	2	Y	1,655	50.4	52.3	39.1	50.7	52.5	0.3	0.2	607	513	608	514	451	381	260	220
71	Ndiarindé Roundé	2	Y	1,003	50.4	52.3	44.8	51.4	53.0	1.0	0.7	607	513	608	514	451	381	260	220
72	Ndiarindé Missidé	2	Y	1,024	50.4	52.3	44.5	51.4	53.0	1.0	0.7	607	513	608	514	451	381	260	220
73	Sintiourou Hafia	2	N	1,007	43.9	43.9	39.7	45.3	45.3	1.4	1.4	694	1,122	695	695	515	515	297	297
74	Koungnoubé	2	N	1,114	41.4	39.5	38.6	43.2	42.1	1.8	2.6	867	1,026	868	1,028	644	762	371	439
75	Sintiourou Baladaroul	2	Y	1,740	41.4	39.5	38.6	43.2	42.1	1.8	2.6	1,351	1,600	1,354	1,603	1,004	1,188	579	685
76	Parawol Malassi	2	Y	700	45.5	51.8	48.8	50.5	53.6	5.0	1.8	939	536	940	537	697	398	402	230
82	Kalinko Guessoré	2	Y	2,444	39.4	38.8	34.7	40.7	40.2	1.3	1.4	1,614	1,703	1,617	1,706	1,199	1,264	691	729
83	Kahel Mbody	2	Y	1,166	38.0	34.0	43.1	44.2	43.6	6.2	9.6	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
85	Kourawel	2	Y	232	38.0	34.0	61.2	61.2	61.2	23.2	27.2	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
86	Sintiourou Kourawel	2	Y	34	38.0	34.0	82.7	82.7	82.7	44.7	48.7	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
87	Nyalé Dja´man	2	Y	1,874	38.0	34.0	37.7	40.9	39.3	2.9	5.3	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
88	Nyalé Moussa	2	Y	1,741	38.0	34.0	38.6	41.3	39.9	3.3	5.9	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
89	Nyalé Hogo	2	Y	1,459	38.0	34.0	40.5	42.5	41.4	4.5	7.4	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
90	Nyalé Boussoura	2	N	928	38.0	34.0	40.6	42.5	41.5	4.5	7.5	1,172	1,673	1,174	1,676	871	1,242	502	716
91	Sintiourou Boussoura	2	N	851	38.0	34.0	41.6	43.2	42.3	5.2	8.3	1,172	1,673	1,174	1,676	871	1,242	502	716
92	Nyalé Missidé	2	N	1,780	38.0	34.0	33.3	39.3	36.7	1.3	2.7	1,172	1,673	1,174	1,676	871	1,242	502	716
113	Daba Ley	2	Y	1,630	36.2	37.1	39.3	41.0	41.3	4.8	4.2	2,145	1,980	2,149	1,984	1,593	1,471	919	848
114	Sellawol	2	N	2,914	48.6	45.0	27.8	48.6	45.1	0.0	0.1	457	629	458	630	339	467	196	270
115	Doumoun Cogon	2	N	4,240	48.6	45.0	23.5	48.6	45.0	0.0	0.0	457	629	458	630	339	467	196	270
116	Lougal	2	Y	1,579	50.4	52.3	39.6	50.8	52.5	0.4	0.2	607	513	608	514	451	381	260	220
117	Djoloun	2	N	2,439	50.4	52.3	29.8	50.4	52.3	0.0	0.0	389	329	390	330	289	244	167	141
127	Guegueré	2	Y	246	38.6	32.1	60.6	60.6	60.6	22.0	28.5	1,733	3,088	1,736	3,094	1,287	2,293	742	1,323
128	Fassely Belenderé	2	N	485	39.4	38.8	47.9	48.5	48.4	9.1	9.6	1,035	1,092	1,037	1,094	769	811	443	468
129	Bandodji Touguidjé	2	N	549	38.6	32.1	46.5	47.2	46.7	8.6	14.6	1,111	1,980	1,113	1,984	825	1,471	476	848
130	Bandodji Nyalbi	2	N	1,832	38.6	32.1	33.0	39.7	35.6	1.1	3.5	1,111	1,980	1,113	1,984	825	1,471	476	848
131	Daara	2	Y	298	38.0	34.0	58.4	58.4	58.4	20.4	24.4	1,828	2,608	1,831	2,613	1,358	1,937	783	1,117
132	Bosseré	2	N	1,915	38.0	34.0	32.5	39.1	36.3	1.1	2.3	1,172	1,673	1,174	1,676	871	1,242	502	716
133	Boundi Foulasso	2	N	4,285	38.0	34.0	23.4	38.1	34.4	0.1	0.4	1,172	1,673	1,174	1,676	871	1,242	502	716
134	Feto Kewewol	2	N	4,317	38.6	32.1	23.3	38.7	32.6	0.1	0.5	1,111	1,980	1,113	1,984	825	1,471	476	848
135	Pomboniwol	2	N	4,108	38.6	32.1	23.9	38.7	32.7	0.1	0.6	1,111	1,980	1,113	1,984	825	1,471	476	848
136	Sintiourou Nalbewou	2	N	4,005	38.6	32.1	24.2	38.8	32.7	0.2	0.6	1,111	1,980	1,113	1,984	825	1,471	476	848
140	Wendou Baga	2	Y	3,638	38.2	30.9	30.3	38.8	33.6	0.6	2.7	1,796	3,436	1,799	3,442	1,334	2,551	769	1,471
141	Pétoum Nyalbi	2	Y	2,569	38.2	30.9	34.2	39.6	35.8	1.4	4.9	1,796	3,436	1,799	3,442	1,334	2,551	769	1,471
142	Pora Hodho	2	N	2,165	38.2	30.9	31.1	39.0	34.0	0.8	3.1	1,152	2,203	1,154	2,207	855	1,636	493	944
143	Sintiourou Thiéweré	2	N	1,684	38.2	30.9	33.9	39.6	35.7	1.4	4.8	1,152	2,203	1,154	2,207	855	1,636	493	944
144	Sintiourou Sa´kou Timbi	2	N	2,849	38.2	30.9	28.0	38.6	32.7	0.4	1.8	1,152	2,203	1,154	2,207	855	1,636	493	944
145	Pora Banla	2	N	2,363	38.2	30.9	30.1	38.8	33.5	0.6	2.6	1,152	2,203	1,154	2,207	855	1,636	493	944
148	Diandian	2	N	2,800	38.2	30.9	28.2	38.6	32.8	0.4	1.9	1,152	2,203	1,154	2,207	855	1,636	493	944
149	Parawol Kouradjé	2	N	765	45.5	51.8	42.8	47.4	52.3	1.9	0.5	602	344	603	345	447	255	258	147
150	Sintiourou Hakoundethiangui	2	N	2,226	38.0	34.0	30.8	38.8	35.7	0.8	1.7	1,172	1,673	1,174	1,676	871	1,242	502	716
151	Carrefour Parawol	2	Y	486	40.1	39.6	52.9	53.1	53.1	13.0	13.5	1,517	1,586	1,520	1,589	1,126	1,178	650	679
152	Madina Dian	2	Y	776	40.1	39.6	47.6	48.3	48.3	8.2	8.7	1,517	1,586	1,520	1,589	1,126	1,178	650	679
153	Sintiourou Nyaka	2	N	1,755	36.2	37.1	33.5	38.1	38.7	1.9	1.6	1,376	1,270	1,378	1,272	1,022	943	589	544
154	Thiaghé	2	N	3,454	48.6	45.0	25.8	48.6	45.1	0.0	0.1	457	629	458	630	339	467	196	270
155	Kalinko Pouta´	2	N	2,138	39.4	38.8	31.2	40.0	39.5	0.6	0.7	1,035	1,092	1,037	1,094	769	811	443	468
156	Nyangaba	2	Y	1,570	39.4	38.8	39.7	42.6	42.3	3.2	3.5	1,614	1,703	1,617	1,706	1,199	1,264	691	729
157	Kalinko Ley	2	N	1,037	39.4	38.8	39.4	42.4	42.1	3.0	3.3	1,035	1,092	1,037	1,094	769	811	443	468
158	Kalinko Ley 2	2	N	1,052	39.4	38.8	39.2	42.3	42.0	2.9	3.2	1,035	1,092	1,037	1,094	769	811	443	468
159	Sintiourou Madina	2	N	1,189	39.4	38.8	37.8	41.7	41.4	2.3	2.6	1,035	1,092	1,037	1,094	769	811	443	468

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
161	Telli Bofi	2	N	989	39.4	38.8	39.9	42.7	42.4	3.3	3.6	1,035	1,092	1,037	1,094	769	811	443	468
162	Kankalaré Hacoudé	2	Y	353	39.4	38.8	56.5	56.6	56.6	17.2	17.8	1,614	1,703	1,617	1,706	1,199	1,264	691	729
163	Parawi Saleah 1	2	N	312	39.4	38.8	52.9	53.1	53.0	13.7	14.2	1,035	1,092	1,037	1,094	769	811	443	468
164	Parawi Saleah 2	2	Y	381	39.4	38.8	55.6	55.7	55.7	16.3	16.9	1,614	1,703	1,617	1,706	1,199	1,264	691	729
165	Parawi Saleah 3	2	Y	435	39.4	38.8	54.1	54.3	54.3	14.9	15.5	1,614	1,703	1,617	1,706	1,199	1,264	691	729
166	Parawi	2	Y	303	39.4	38.8	58.2	58.3	58.3	18.9	19.5	1,614	1,703	1,617	1,706	1,199	1,264	691	729
167	Feto Parawi 2	2	Y	316	39.4	38.8	57.8	57.8	57.8	18.4	19.0	1,614	1,703	1,617	1,706	1,199	1,264	691	729
169	Feto Parawi 1	2	Y	637	39.4	38.8	49.9	50.2	50.2	10.8	11.4	1,614	1,703	1,617	1,706	1,199	1,264	691	729
170	Bourreti	2	Y	817	40.1	39.6	47.1	47.9	47.8	7.8	8.2	1,517	1,586	1,520	1,589	1,126	1,178	650	679
171	Ndantari	2	N	1,627	40.1	39.6	34.3	41.1	40.7	1.0	1.1	973	1,017	975	1,019	722	755	417	436
172	Sitako	2	N	591	38.2	30.9	45.7	46.4	45.9	8.2	15.0	1,152	2,203	1,154	2,207	855	1,636	493	944
173	Sintiourou Daroul Diandian	2	Y	2,500	38.2	30.9	34.5	39.7	36.1	1.5	5.2	1,796	3,436	1,799	3,442	1,334	2,551	769	1,471
174	Kourawi	2	N	4,095	38.2	30.9	23.9	38.4	31.7	0.2	0.8	1,152	2,203	1,154	2,207	855	1,636	493	944
175	Thiankwé	2	Y	1,832	40.1	39.6	38.0	42.2	41.9	2.1	2.3	1,517	1,586	1,520	1,589	1,126	1,178	650	679
176	Toumbeta	2	N	3,531	40.1	39.6	25.6	40.3	39.8	0.2	0.2	973	1,017	975	1,019	722	755	417	436
179	Limbiko	2	Y	2,226	38.2	30.9	35.8	40.2	37.0	2.0	6.1	1,796	3,436	1,799	3,442	1,334	2,551	769	1,471
180	Karé Dabbhel	2	Y	1,156	40.1	39.6	43.2	44.9	44.7	4.8	5.1	1,517	1,586	1,520	1,589	1,126	1,178	650	679
181	Missira	2	N	2,357	38.2	30.9	30.1	38.8	33.5	0.6	2.6	1,152	2,203	1,154	2,207	855	1,636	493	944
182	Sintiourou Missira	2	N	1,997	38.2	30.9	32.0	39.1	34.5	0.9	3.6	1,152	2,203	1,154	2,207	855	1,636	493	944
183	Daroul	2	Y	286	43.9	43.9	58.9	59.0	59.0	15.1	15.1	1,082	1,749	1,084	1,084	804	804	463	463
184	Pora PK130	2	Y	302	43.9	43.9	58.3	58.4	58.4	14.5	14.5	1,082	1,749	1,084	1,084	804	804	463	463
185	Sakidjé	2	Y	660	43.9	43.9	49.5	50.5	50.5	6.6	6.6	1,082	1,749	1,084	1,084	804	804	463	463
187	Kalinko Roundé	2	N	1,098	50.4	52.3	38.7	50.7	52.5	0.3	0.2	389	329	390	330	289	244	167	141
188	Thiangui Bonodji	2	Y	4,039	48.6	45.0	29.1	48.6	45.1	0.0	0.1	713	981	714	983	529	729	305	420
189	Sintiourou Kerkeré	2	N	4,140	38.2	30.9	23.8	38.4	31.7	0.2	0.8	1,152	2,203	1,154	2,207	855	1,636	493	944
190	Sintiourou Toumbeta	2	N	3,783	40.1	39.6	24.8	40.2	39.7	0.1	0.1	973	1,017	975	1,019	722	755	417	436
191	Ndanta Fongné Ley	2	Y	748	36.2	37.1	48.0	48.3	48.4	12.1	11.3	2,145	1,980	2,149	1,984	1,593	1,471	919	848
192	Sintiourou Lengueré	2	Y	511	38.6	32.1	52.3	52.5	52.4	13.9	20.3	1,733	3,088	1,736	3,094	1,287	2,293	742	1,323

Table G.3: Separation Distances for 3 Working Areas

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
1	Hamdalaye	3	Y	185	53.1	55.1	65.1	65.4	65.5	12.3	10.4	697	459	552	460	407	339	232	194
2	Fassely Fouta Bé	3	Y	204	36.5	36.5	64.1	64.1	64.1	27.6	27.6	2,478	2,478	2,483	2,483	1,830	1,830	1,044	1,044
3	Boulleré	3	N	2,072	38.6	32.1	33.5	39.8	35.9	1.2	3.8	1,302	2,347	1,305	2,351	962	1,733	549	989
4	Mbouroré	3	Y	585	36.5	36.5	52.4	52.5	52.5	16.0	16.0	2,478	2,478	2,483	2,483	1,830	1,830	1,044	1,044
5	Paragogo	3	Y	374	53.1	55.1	57.4	58.8	59.4	5.7	4.3	697	459	552	460	407	339	232	194
6	Ndantary	3	Y	1,420	41.4	39.5	42.6	45.1	44.4	3.7	4.9	1,590	1,888	1,593	1,892	1,174	1,394	670	795
7	Boundou Wandé	3	N	336	43.9	43.9	53.6	54.0	54.0	10.1	10.1	806	1,315	807	807	595	595	339	339
8	Kagnéka	3	Y	172	50.4	52.3	65.9	66.0	66.1	15.6	13.8	703	592	705	593	519	437	296	249
9	Sintiourou Kaouri Bowé	3	N	1,144	50.4	52.3	40.0	50.8	52.6	0.4	0.3	447	376	448	377	330	278	188	159
14	Madina Kankalaré	3	Y	1,068	39.4	38.8	45.8	46.7	46.6	7.3	7.8	1,906	2,012	1,909	2,016	1,407	1,485	803	847
15	Kankalaré	3	Y	191	39.4	38.8	64.8	64.8	64.8	25.4	26.0	1,906	2,012	1,909	2,016	1,407	1,485	803	847
57	Ndanta Fongné Dow	3	Y	1,135	36.2	37.1	45.1	45.6	45.8	9.4	8.7	2,546	2,347	2,551	2,351	1,880	1,733	1,073	989
58	Cogon Lengué	3	Y	485	48.6	45.0	54.5	55.5	55.0	6.9	10.0	828	1,147	829	1,149	611	847	349	483
59	Sambou1	3	Y	1,778	48.6	45.0	40.2	49.2	46.2	0.6	1.2	828	1,147	829	1,149	611	847	349	483
60	Sambou2	3	N	1,983	48.6	45.0	34.0	48.7	45.3	0.1	0.3	526	729	527	731	389	538	222	307
61	Hore Sella1	3	Y	2,314	36.2	37.1	37.3	39.8	40.2	3.6	3.1	2,546	2,347	2,551	2,351	1,880	1,733	1,073	989
62	Hore Sella2	3	Y	1,995	36.2	37.1	38.9	40.8	41.1	4.6	4.0	2,546	2,347	2,551	2,351	1,880	1,733	1,073	989
63	Daba Dow	3	Y	1,174	36.2	37.1	44.7	45.3	45.4	9.1	8.3	2,546	2,347	2,551	2,351	1,880	1,733	1,073	989
64	Hore Sella 3	3	N	1,341	36.2	37.1	38.3	40.4	40.7	4.2	3.6	1,619	1,492	1,622	1,495	1,195	1,101	682	628
65	Sella Roundé	3	N	3,828	48.6	45.0	26.7	48.6	45.1	0.0	0.1	526	729	527	731	389	538	222	307
66	Passago	3	N	2,770	48.6	45.0	30.3	48.7	45.1	0.1	0.1	526	729	527	731	389	538	222	307
67	Parawol Aliou	3	Y	183	38.0	34.0	65.2	65.2	65.2	27.2	31.2	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
68	Hore Lafou	3	Y	627	45.5	51.8	51.7	52.6	54.7	7.1	2.9	1,096	620	1,098	621	809	457	462	261
69	Lafou Mbayla	3	Y	1,645	45.5	51.8	41.0	46.8	52.1	1.3	0.3	1,096	620	1,098	621	809	457	462	261
70	Hafia1	3	Y	1,655	50.4	52.3	41.0	50.9	52.6	0.5	0.3	703	592	705	593	519	437	296	249
71	Ndiarindé Roundé	3	Y	1,003	50.4	52.3	46.5	51.9	53.3	1.5	1.0	703	592	705	593	519	437	296	249
72	Ndiarindé Missidé	3	Y	1,024	50.4	52.3	46.2	51.8	53.3	1.4	1.0	703	592	705	593	519	437	296	249
73	Sintiourou Hafia	3	N	1,007	43.9	43.9	41.4	45.9	45.9	2.0	2.0	806	1,315	807	807	595	595	339	339
74	Koungnoubé	3	N	1,114	41.4	39.5	40.3	43.9	42.9	2.5	3.4	1,011	1,200	1,012	1,203	746	886	426	506
75	Sintiourou Baladaroul	3	Y	1,740	41.4	39.5	40.4	43.9	43.0	2.5	3.5	1,590	1,888	1,593	1,892	1,174	1,394	670	795
76	Parawol Malassi	3	Y	700	45.5	51.8	50.5	51.7	54.2	6.2	2.4	1,096	620	1,098	621	809	457	462	261
82	Kalinko Guessoré	3	Y	2,444	39.4	38.8	36.7	41.2	40.9	1.8	2.1	1,906	2,012	1,909	2,016	1,407	1,485	803	847
83	Kahel Mbody	3	Y	1,166	38.0	34.0	44.8	45.6	45.2	7.6	11.2	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
85	Kourawel	3	Y	232	38.0	34.0	62.6	62.7	62.6	24.7	28.6	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
86	Sintiourou Kourawel	3	Y	34	38.0	34.0	83.7	83.7	83.7	45.7	49.7	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
87	Nyalé Dja´man	3	Y	1,874	38.0	34.0	39.6	41.9	40.6	3.9	6.6	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
88	Nyalé Moussa	3	Y	1,741	38.0	34.0	40.4	42.4	41.3	4.4	7.3	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309

ID	Village Name	Equation selection		Dist. To Nearest WA (m)	Approx. Background Sound Level (dBA)		Predicted Project SL (dBA)	Total Future Sound Level (dBA)		Predicted Increment (dBA)		Strict IFC Required Setback Dist. (m)		General Setback Separation Distance (m) (Increments, dB)					
		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
89	Nyalé Hogo	3	Y	1,459	38.0	34.0	42.3	43.7	42.9	5.7	8.9	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
90	Nyalé Boussoura	3	N	928	38.0	34.0	42.3	43.7	42.9	5.7	8.9	1,375	1,976	1,378	1,980	1,015	1,459	579	832
91	Sintiourou Boussoura	3	N	851	38.0	34.0	43.3	44.4	43.8	6.4	9.8	1,375	1,976	1,378	1,980	1,015	1,459	579	832
92	Nyalé Missidé	3	N	1,780	38.0	34.0	35.2	39.8	37.6	1.8	3.6	1,375	1,976	1,378	1,980	1,015	1,459	579	832
113	Daba Ley	3	Y	1,630	36.2	37.1	41.1	42.3	42.6	6.1	5.5	2,546	2,347	2,551	2,351	1,880	1,733	1,073	989
114	Sellawol	3	N	2,914	48.6	45.0	29.7	48.7	45.1	0.1	0.1	526	729	527	731	389	538	222	307
115	Doumoun Cogon	3	N	4,240	48.6	45.0	25.6	48.6	45.0	0.0	0.0	526	729	527	731	389	538	222	307
116	Lougal	3	Y	1,579	50.4	52.3	41.5	50.9	52.6	0.5	0.3	703	592	705	593	519	437	296	249
117	Djoloun	3	N	2,439	50.4	52.3	31.7	50.5	52.3	0.1	0.0	447	376	448	377	330	278	188	159
127	Guegueré	3	Y	246	38.6	32.1	62.0	62.0	62.0	23.4	29.9	2,049	3,692	2,053	3,699	1,513	2,726	863	1,555
128	Fassely Belenderé	3	N	485	39.4	38.8	49.5	49.9	49.8	10.5	11.0	1,211	1,279	1,214	1,281	894	944	510	539
129	Bandodji Touguidjé	3	N	549	38.6	32.1	48.1	48.6	48.2	10.0	16.1	1,302	2,347	1,305	2,351	962	1,733	549	989
130	Bandodji Nyalbi	3	N	1,832	38.6	32.1	34.8	40.1	36.7	1.5	4.6	1,302	2,347	1,305	2,351	962	1,733	549	989
131	Daara	3	Y	298	38.0	34.0	59.9	59.9	59.9	21.9	25.9	2,163	3,108	2,167	3,114	1,597	2,295	911	1,309
132	Bosseré	3	N	1,915	38.0	34.0	34.3	39.6	37.2	1.6	3.2	1,375	1,976	1,378	1,980	1,015	1,459	579	832
133	Boundi Foulasso	3	N	4,285	38.0	34.0	25.5	38.2	34.6	0.2	0.6	1,375	1,976	1,378	1,980	1,015	1,459	579	832
134	Feto Kewewol	3	N	4,317	38.6	32.1	25.4	38.8	32.9	0.2	0.8	1,302	2,347	1,305	2,351	962	1,733	549	989
135	Pomboniwol	3	N	4,108	38.6	32.1	25.9	38.8	33.0	0.2	0.9	1,302	2,347	1,305	2,351	962	1,733	549	989
136	Sintiourou Nalbewou	3	N	4,005	38.6	32.1	26.2	38.8	33.1	0.2	1.0	1,302	2,347	1,305	2,351	962	1,733	549	989
140	Wendou Baga	3	Y	3,638	38.2	30.9	32.3	39.2	34.6	1.0	3.7	2,124	4,116	2,128	4,124	1,568	3,039	895	1,734
141	Pétoum Nyalbi	3	Y	2,569	38.2	30.9	36.1	40.3	37.2	2.1	6.3	2,124	4,116	2,128	4,124	1,568	3,039	895	1,734
142	Pora Hodho	3	N	2,165	38.2	30.9	33.0	39.3	35.1	1.1	4.2	1,350	2,617	1,353	2,621	997	1,932	569	1,102
143	Sintiourou Thiéweré	3	N	1,684	38.2	30.9	35.8	40.2	37.0	2.0	6.1	1,350	2,617	1,353	2,621	997	1,932	569	1,102
144	Sintiourou Sa´kou Timbi	3	N	2,849	38.2	30.9	30.0	38.8	33.5	0.6	2.6	1,350	2,617	1,353	2,621	997	1,932	569	1,102
145	Pora Banla	3	N	2,363	38.2	30.9	32.0	39.1	34.5	0.9	3.6	1,350	2,617	1,353	2,621	997	1,932	569	1,102
148	Diandian	3	N	2,800	38.2	30.9	30.2	38.8	33.6	0.6	2.7	1,350	2,617	1,353	2,621	997	1,932	569	1,102
149	Parawol Kouradjé	3	N	765	45.5	51.8	44.5	48.0	52.5	2.5	0.7	697	394	698	395	515	291	294	166
150	Sintiourou Hakoundethiangui	3	N	2,226	38.0	34.0	32.7	39.1	36.4	1.1	2.4	1,375	1,976	1,378	1,980	1,015	1,459	579	832
151	Carrefour Parawol	3	Y	486	40.1	39.6	54.5	54.6	54.6	14.5	15.0	1,788	1,871	1,792	1,875	1,320	1,382	753	788
152	Madina Dian	3	Y	776	40.1	39.6	49.3	49.8	49.8	9.7	10.2	1,788	1,871	1,792	1,875	1,320	1,382	753	788
153	Sintiourou Nyaka	3	N	1,755	36.2	37.1	35.3	38.8	39.3	2.6	2.2	1,619	1,492	1,622	1,495	1,195	1,101	682	628
154	Thiaghé	3	N	3,454	48.6	45.0	27.8	48.6	45.1	0.0	0.1	526	729	527	731	389	538	222	307
155	Kalinko Pouta´	3	N	2,138	39.4	38.8	33.1	40.3	39.8	0.9	1.0	1,211	1,279	1,214	1,281	894	944	510	539
156	Nyangaba	3	Y	1,570	39.4	38.8	41.5	43.6	43.4	4.2	4.6	1,906	2,012	1,909	2,016	1,407	1,485	803	847
157	Kalinko Ley	3	N	1,037	39.4	38.8	41.1	43.4	43.1	4.0	4.3	1,211	1,279	1,214	1,281	894	944	510	539
158	Kalinko Ley 2	3	N	1,052	39.4	38.8	41.0	43.3	43.0	3.9	4.2	1,211	1,279	1,214	1,281	894	944	510	539
159	Sintiourou Madina	3	N	1,189	39.4	38.8	39.6	42.5	42.2	3.1	3.4	1,211	1,279	1,214	1,281	894	944	510	539

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		No. Work Areas	Line of Sight?		Day	Night		Day	Night	Day	Night	Day	Night	3		5		10	
161	Telli Bofi	3	N	989	39.4	38.8	41.6	43.7	43.5	4.3	4.7	1,211	1,279	1,214	1,281	894	944	510	539
162	Kankalaré Hacoudé	3	Y	353	39.4	38.8	58.0	58.1	58.1	18.7	19.3	1,906	2,012	1,909	2,016	1,407	1,485	803	847
163	Parawi Saleah 1	3	N	312	39.4	38.8	54.4	54.5	54.5	15.1	15.7	1,211	1,279	1,214	1,281	894	944	510	539
164	Parawi Saleah 2	3	Y	381	39.4	38.8	57.2	57.2	57.2	17.8	18.4	1,906	2,012	1,909	2,016	1,407	1,485	803	847
165	Parawi Saleah 3	3	Y	435	39.4	38.8	55.7	55.8	55.8	16.4	17.0	1,906	2,012	1,909	2,016	1,407	1,485	803	847
166	Parawi	3	Y	303	39.4	38.8	59.7	59.7	59.7	20.3	20.9	1,906	2,012	1,909	2,016	1,407	1,485	803	847
167	Feto Parawi 2	3	Y	316	39.4	38.8	59.2	59.3	59.3	19.9	20.5	1,906	2,012	1,909	2,016	1,407	1,485	803	847
169	Feto Parawi 1	3	Y	637	39.4	38.8	51.5	51.8	51.7	12.4	12.9	1,906	2,012	1,909	2,016	1,407	1,485	803	847
170	Bourreti	3	Y	817	40.1	39.6	48.7	49.3	49.2	9.2	9.6	1,788	1,871	1,792	1,875	1,320	1,382	753	788
171	Ndantari	3	N	1,627	40.1	39.6	36.1	41.6	41.2	1.5	1.6	1,137	1,190	1,139	1,192	839	878	479	501
172	Sitako	3	N	591	38.2	30.9	47.3	47.8	47.4	9.6	16.5	1,350	2,617	1,353	2,621	997	1,932	569	1,102
173	Sintiourou Daroul Diandian	3	Y	2,500	38.2	30.9	36.4	40.4	37.5	2.2	6.6	2,124	4,116	2,128	4,124	1,568	3,039	895	1,734
174	Kourawi	3	N	4,095	38.2	30.9	26.0	38.5	32.1	0.3	1.2	1,350	2,617	1,353	2,621	997	1,932	569	1,102
175	Thiankwé	3	Y	1,832	40.1	39.6	39.8	43.0	42.7	2.9	3.1	1,788	1,871	1,792	1,875	1,320	1,382	753	788
176	Toumbeta	3	N	3,531	40.1	39.6	27.6	40.3	39.9	0.2	0.3	1,137	1,190	1,139	1,192	839	878	479	501
179	Limbiko	3	Y	2,226	38.2	30.9	37.7	41.0	38.5	2.8	7.6	2,124	4,116	2,128	4,124	1,568	3,039	895	1,734
180	Karé Dabbhel	3	Y	1,156	40.1	39.6	44.9	46.2	46.0	6.1	6.4	1,788	1,871	1,792	1,875	1,320	1,382	753	788
181	Missira	3	N	2,357	38.2	30.9	32.1	39.1	34.5	0.9	3.6	1,350	2,617	1,353	2,621	997	1,932	569	1,102
182	Sintiourou Missira	3	N	1,997	38.2	30.9	33.9	39.6	35.7	1.4	4.8	1,350	2,617	1,353	2,621	997	1,932	569	1,102
183	Daroul	3	Y	286	43.9	43.9	60.3	60.4	60.4	16.5	16.5	1,267	2,068	1,270	1,270	936	936	534	534
184	Pora PK130	3	Y	302	43.9	43.9	59.7	59.8	59.8	15.9	15.9	1,267	2,068	1,270	1,270	936	936	534	534
185	Sakidjé	3	Y	660	43.9	43.9	51.1	51.9	51.9	8.0	8.0	1,267	2,068	1,270	1,270	936	936	534	534
187	Kalinko Roundé	3	N	1,098	50.4	52.3	40.5	50.8	52.6	0.4	0.3	447	376	448	377	330	278	188	159
188	Thiangui Bonodji	3	Y	4,039	48.6	45.0	31.1	48.7	45.2	0.1	0.2	828	1,147	829	1,149	611	847	349	483
189	Sintiourou Kerkeré	3	N	4,140	38.2	30.9	25.8	38.4	32.1	0.2	1.2	1,350	2,617	1,353	2,621	997	1,932	569	1,102
190	Sintiourou Toumbeta	3	N	3,783	40.1	39.6	26.8	40.3	39.8	0.2	0.2	1,137	1,190	1,139	1,192	839	878	479	501
191	Ndanta Fongné Ley	3	Y	748	36.2	37.1	49.7	49.9	49.9	13.7	12.8	2,546	2,347	2,551	2,351	1,880	1,733	1,073	989
192	Sintiourou Lengueré	3	Y	511	38.6	32.1	53.9	54.0	53.9	15.4	21.8	2,049	3,692	2,053	3,699	1,513	2,726	863	1,555