

**Technical Analysis - Biota Monitoring Guide Public Consultation  
Navy in Maritime Seismic Surveys (June 2018)**

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**Appendix II - PMBM and PMAP General Registry Worksheets.**

**Annex I - Guide for Monitoring Marine Biota in Maritime Seismic Surveys (June 2018) with line numbering.**

## Technical Analysis - Biota Monitoring Guide Public Consultation Navy in Maritime Seismic Surveys (June 2018)

### 1. Introduction

This document was prepared by the *International Association of Geophysical Contractors* (IAGC) for the presentation of technical analysis on the new Monitoring of Marine Biota in Maritime Seismic Surveys (June 2018), under the of the respective Public Consultation, promoted by the Brazilian Institute of Environment and Natural Renewable Resources - IBAMA. The same has been consolidated from suggestions and comments from the IAGC member companies from the Brazil committee and the main companies consultants providing environmental services in the implementation of the PMBM and WFP projects.

The IAGC is the International Association which, for more than 45 years, has been the global voice of geophysical industry, being the only worldwide organization exclusively dedicated to the sector. THE Association represents more than 110 companies, belonging to all segments of the geophysical industry. Our members help shape industry priorities and sections, committees and working groups.

The member companies of the IAGC, for the safety of the operations, respecting the requirements around the world, following best practices and supporting initiatives to better understand and mitigate the potential impacts of the activity.

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## **2. Technical Analysis**

The consolidated Technical Analysis is as follows, following the itemization and the numbering of Guide lines, presented in the [Annex I](#), of this document.

### ***1.1. Objectives - pg.3, Line 14 - "air cannons"***

It is suggested that throughout the Guide the terminology "air guns" be replaced by "sources seismic ". The aforementioned jargon, currently in disuse by industry, is being used several times throughout the Guide. O [Appendix I](#) indicates the location (page and line) of all uses.

### ***1.1. Objectives - pg.3, Line 14 - "shots"***

In order to align the terminologies, as indicated in the previous item, it is suggested that the terminology "shots" is replaced by "noise emissions" or

"Emissions". O [Appendix I i](#) TIP location (page, row) in all uses of the term.

**1.2. Terminology - p.3, Line 27 to 29:**

*"Acquisition Area: area where the acquisition of seismic data is performed. IT IS represented by a polygon in which shots are made at full power. "*

It is suggested to change the definition of the terminology Acquisition Area, so that the same integrate not only the area where seismic data are acquired, but also integrate the regions of " *run in* " and " *run out* " .

The area of data acquisition, sent to IBAMA, when the project is licensed seismic data is the area in which seismic data must be acquired in which, after being processed, can provide assertive information on the subsoil.

In order to obtain the data from the edges of the Acquisition Area, there are sections called " *run in* " and " *run out* ", which are the sections that must be traversed at the beginning (" *run in* ") and end (" *run out* ") of each seismic line, where the power sources follows the normal pattern used during the search ( *full power* ). It should be noted that the *run out* is superior in distance to *run in* due to the length of the seismic cables.

Due to this peculiarity, applicable to any and all data acquisition project with the use of towable hydrophone cables, we believe

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of the following text, in order to reflect the reality of the activity. Therefore, it is suggested following wording:

*"Acquisition Area: area where the acquisition of seismic data is performed, incorporating the *run in* and *run out areas* . It is represented by a polygon in which noise emissions are made at full power. "*

**1.2. Terminology - p.3, Line 38 to 43.**

*"Exclusion Area: area formed by a radius of 1,000m originating from the center of the array of guns*

*of air. This is the limit at which air guns should be turned off if a marine mammal or cheloderm is sighted during the normal operating situation, seismic source tests or gradual increase procedure. Referred in international jargon as Exclusion Zone (EZ) or Safety Zone. "*

The industry supports the adoption of mitigation measures, celebrating those based on studies and technical-scientific conclusions that can support them. In this way, we would like to question the change in the area of mitigation, formerly defined by the Areas of Safety and Warning, to create a 1,000m Exclusion Area.

Evaluating the signatures of the sources of most of the activities carried out in the Brazil, there is an expressive decay in the first meters (0-300), where most of high frequency emissions are dissipated. Therefore, we understand that the radius of 500 meters to the exclusion zone is justified, but the sound pulse level will be below the 160 dB, respecting the boundary zones.

With the increase of the mitigation area, where the immediate in the event of detection of mammals or marine increase in the seismic vessel's permanence in the area of activity, without proving increase in the effectiveness of mitigation of probable acoustic impact.

On the contrary, it is understood that this action could lead to a interaction of seismic research activities with socioeconomic activities, such as fishing, and consequent increase in noise exposure in the marine environment.

It is necessary that the consequences of this modification be taken into account and that that this decision will be for the protection of marine sufficient scientific basis to be applied throughout the Brazilian territory.

It is noteworthy that the British JNCC reference agency carried out a recent review,

2017, in its monitoring guidelines, keeping the mitigation area as 500 meters, and can be changed in special situations, evaluated in the licensing process. O

American reference body BOEM also considers the area of 500 meters around the sound sources as a mitigate area.

**1.2. Terminology** - p.4, Line 48 to 49.

*"Watch: visual detection of marine animals in or around the seismic vessel, inside or outside of the Exclusion Area. "*

It is suggested to modify the definition of "Avistagem" to incorporate in a clear way the group of marine animals indicated in the Guide, as indicated in the objectives of the document: *" The Marine Biota Monitoring Project has two objectives: (i) to implement measures to mitigate the impact of seismic surveys on **mammals and marine chelonians** ... "*

Therefore, it is advisable to edit the text to:

*"Watch: visual detection of mammals and marine chelonians in the vicinity of the seismic vessel, within or outside the Exclusion Area. "*

**1.2. Terminology** - pg.4, Line 78 to 81.

*"Air cannon test: short-lived procedure in which the cannons are fired to calibration purposes or other operational reasons. Priority should be given to tests in full power within the acquisition area, avoiding the maneuvering area. "*

It is suggested to modify the definition of "Seismic Source Tests" to align the definition of "Maneuver Area" (page 3, Line 30), where it is explained that tests in power are permitted within this region in line exchanges.

In this way, it is proposed to edit the text to:

*"Sound source test: short-term procedure in which sound calibration purposes or other operational reasons. Tests at full power may occur in the acquisition area and in the maneuvering area, in the latter only during line changes. "*

**2.1. Research Planning** - p.5, Lines 93 to 100.

*"• To inquire about the existence of other seismic surveys being planned or already in licensing for the same region and adjust schedules in order to avoid overlapping space of activities. If there is overlapping of seismic surveys, special arrangements may be required from tenderers, as well as*

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*mitigation and monitoring. Depending on the case, the environmental viability itself performance of the overlapped activity may be denied in the licensing process. "*

The text above is related to the licensing process and not to the activity monitoring, object of the Current Review Guide. In addition, it should be added that the entrepreneur does not have access to the updated schedule information and characteristics of seismic surveys carried out by other companies. The domain content information available on the IBAMA website is related to the Activity Characterization (FCA) of the Projects, which is issued in the preliminary licensing phase. During the procedure licensing, with the delivery of the Complementary Information Report to PCAS and possible opinions, the schedules of the activities and their characteristics can be modified and / or updated. Thus, it is suggested that the text be withdrawn, since, only the licensing body has access to the information, of the most different required to be aware of the possibility of Projects.

It is worth pointing out that there has been a long-standing misunderstanding that seismic areas covering the same geographic areas are in some way "duplicative" or overlapping, suggesting that they are not necessary or can be "reduced" from some way to share data. On the contrary, there is no duplicative search.

While it may seem that sound sources, listening hardware, and are similar, the configuration of the search and the options of acquisition and processing are numerous. Companies use patented acquisition of research and data processing that make your data and every search different. Research data, even if acquired in geographic areas or time, contain different information about the subsoil and what is below it. As new technical and technological advances are made, there is an incentive to new research, which promises better quality of geophysical data and strong reliable and reliable offshore oil and gas revenues.

**2.1. Research Planning - p.5, Lines 104 to 109.**

- *Plan the use of airgun arrangements that: (i) have the lowest possible power, (ii) minimize the horizontal emission of acoustic energy, and (iii) minimize sound emission in higher frequencies than required for data acquisition.*

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- *Invest in technologies and operational alternatives that reduce noise and less impactful to the environment. "*

Again, as indicated in the previous item, the text indicated above is related to the licensing process and not to the monitoring phase of the activity, the purpose of the current review, and should be considered for inclusion in the review of the FCA guide, or in the guide for elaboration of Complementary Information. Technologies, operational alternatives and arrangement of seismic sources used during a Project, are defined and evaluated during the license and the Seismic Survey License (LPS) is only issued by IBAMA positive evaluation of such activity characteristics. Therefore, it is seen as not applicable to the insertion of the text in the Monitoring Guide.

It is worth clarifying that, in recent years, the idea that seismic surveys could be adjusted to the "lowest levels of practicable sources" for a site or research in particular, it has attracted increased attention from environmental and regulatory to implement additional mitigation measures such as and their volumes.

This occurs despite the fact that the volumes of origin do not correspond linearly to the levels of output (in fact, it is a cubic root relation) and that more than five decades experience no evidence of serious injury, death or marine mammals for seismic pulses, even in the case of larger source matrices.

There is a minimum scope to reduce the source level of an acoustic arrangement by modifying the operating pressure or the total air volume of the array. Change the font level by modifying the number of elements or the dimensions of the array would result in undesirable accentuation



high frequencies and would compromise the quality of seismic data with a loss of low frequencies, since the sound arrangement is designed to act together, canceling out undesirable frequencies.

A goal of achieving reductions in horizontally propagated sound will need to take into account the contributions of the environment in the propagation of the matrix output. The matrix is designed to optimize a relatively short downward and backward propagation through water and many layers of rock of varying thickness and density. Changes in this design to reduce side propagation will be difficult and will certainly reduce image quality. An solution that could produce marginal decreases in laterally propagated energy in the

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in an area would probably not work under different conditions different geology below or different depth profiles in the track, to highlight only some of the environmental variables. This may affect the propagation sound through the water column.

The idea of a simple universal solution to limit or reduce the output of the array without loss of data quality and would provide any measurable benefit to the environment. is impractical and is not supported by the best available scientific data. currently.

With regard to the recommendation "Investing in technologies and operational reduce the contribution of noise and that are less impacting to the environment. "

**2.2. During the survey - p.5, Line 116 to 121.**

*"• Shots outside the Acquisition Area are barred, except for those necessary to the gradual increase procedure and tests during line changes, which must be duly recorded in the operation and effort recording worksheet. Tests at full power preferably within the Acquisition Area, but never outside the Area of Acquisition. Activity."*

It is suggested to modify the above section to align the definition of "Area of Maneuver"

(page 3, Line 30), where it is explained that tests with maximum power are allowed inside this region in line exchanges.

In this way, it is proposed to edit the text to:

*"• It is forbidden to make any sound emission outside the Acquisition Area, except for those necessary for the gradual increase procedure and tests during line changes, which must be properly recorded in the operation and effort record worksheet. Tests in maximum power must occur within the Acquisition and Maneuver Area, but never outside the Area of Activity. "*

**2.2. During the survey - p.5, Line 126 to 131.**

*"• Hold meetings with each crew change to review monitoring of the marine biota to those responsible for the seismic operation, minimizing the occurrence of communication failures. It is recommended to carry out simulated exercises to that all parties involved know how to act during a real detection within the Area of Exclusion;"*

In the above section, please clarify whether the training should be given to each professional who works for the first time in the Project in question. It is proposed that the text for:

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*"• Conduct meetings on the first shipment of each crewmember responsible for the seismic operation to procedures for monitoring the marine biota, minimizing occurrence of communication failures. It is recommended to carry out simulated exercises to that all parties involved know how to act during a real detection within the Area of Exclusion;"*

**3.1. Selection and training of onboard observers - pg.6, Line 173 to 175.**

*"• At least 2 (two) professionals from each observer team must have prior experience in observation of marine biota in the same function on board seismic vessels, for a minimum of 180 days; "*

The previous experience of 180 days implies about 1 year of uninterrupted work of the professionals. Considering the current market situation, where many are migrating to act as MAP Operators, it is possible that this requirement make the formation of teams impossible. It is suggested a reduction in the experience required,

experienced professionals, from 180 days to a previous experience of at least 60 days in the observer function in the seismic activity. Additionally, it is suggested to consider experience in acoustic monitoring programs in scientific cruises, provided that duly trained and instructed on the mitigation procedures for the activity.

In this way, the presented text would be updated to:

*"• At least 2 (two) professionals from each observer team must have prior experience in observation of marine biota in the same function on board seismic vessels, for a minimum of 60 days, the entire team being duly instructed on the procedures prior to the commencement of the activities; "*

**3.1. Selection and training of onboard observers - pg.6, Line 181 to 184.**

*"The entrepreneur is responsible for all the contractual procedures of the team of observers, and must comply with applicable labor laws. It is the entrepreneur's responsibility provide on-board observers with the safety training required as minimum requirements for offshore activities. "*

We would like to remind you that the responsibility for hiring observers, as it has been happening historically, it is from environmental consultancies, which are companies contracted by the entrepreneur. Seismic companies require, in turn, that the consultants follow the relevant legislation. In this way, the following change:

*"The entrepreneur shall ensure that the consulting firms, responsible for all contractual procedures of the observer team, are following the applicable labor legislation. It is the entrepreneur's responsibility to ensure that the on-board required as minimum requirements for offshore activities. "*

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**3.2.1. Observation effort under precarious conditions of visibility - pg.9, Line 291.**

The jargon "warning area" is used, which is not used in this version of the Guide. However, if you replace the term with "exclusion area".

**3.2.1. Observation effort under precarious conditions of visibility - pg.9, Line**

294-296.

*"Sightings carried out under precarious conditions of visibility, although less frequent, continue to determine the interruption of the activity if they occur within the Exclusion Area. "*

Please, ask for clarification on how the activity will be resumed in the event of interruptions of activity by sightings within the exclusion area under precarious visibility. The activity release scan can be performed precarious conditions of visibility with acoustic monitoring together?

### **3.2.5. Operation at night or in poor visibility - pg.11.**

Please request further clarification on what activities monitoring may allow during night operation or poor visibility conditions. O Guidance does not clarify some recurrent scenarios in seismic activities, if listed below:

- A) Beginning of Visual Effort along Acoustic Scan: In the Event of Effort start along an acoustic scan to start the line or test, scan must be continued or restarted by both teams (Observers and MAP Operators)?
- B) Suspension of the Visual Effort along a Visual and Acoustic Scan: If the effort is suspended over a visual and acoustic scan, can you continue scanning by releasing subsequent activities?
- C) Final End of Visual Effort: If, during a line the sources switched off, there is a sighting inside the exclusion zone, may release subsequent activities during night operation or precarious visibility?
- D) Activity Interrupted by Acoustic Detection with Associated Watch: O audible monitoring, during night operation or poor visibility conditions, is

authorized to resume the activity if the activity has been interrupted by a sighting with associated sightings in the exclusion zone?

E) Activity Interrupted by Watch without Associated Acoustic Detection: O audible monitoring, during night operation or poor visibility conditions, is authorized to resume the activity if it has been interrupted by a sighting in the exclusion zone without associated detection?

F) Activity Interrupted by Survey with Associated Acoustic Detection: O audible monitoring, during night operation or poor visibility conditions, is authorized to resume the activity if it has been interrupted by a sighting in the exclusion zone with associated detection?

G) First Activity Sound Emissions: Acoustic monitoring is authorized to resume releases of the activity, in night operation or poor visibility conditions?

H) Sound source tests: Sound monitoring is authorized to resume night operation or poor visibility conditions?

I) Malfunction and Parameters for Safety or Operational Reasons: O acoustic monitoring is authorized to resume the activity if it has been interrupted by a malfunction or for operational and / or safety reasons?

It is suggested that each scenario be commented on in the new Guide and that the decision to be taken in each case.

### **3.2.6. Seismic source tests - pg.6, Line 400 to 403.**

*"If the test is performed with a power lower than the maximum used in the seismic survey, the duration of the gradual increase must be adjusted in proportion to the power used in the test to avoid excessive shots in the environment. "*

Clarification is suggested for scenarios where previous low power tests occur at the beginning of seismic lines. In these cases, it is proposed to adopt the scanning procedure, followed by the gradual increase with proportional duration time for the start of the test and another gradual increase between test and line also with proportional duration between the power used in the test and full power. After the completion of this second gradual increase, activity at full power would be initiated.

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As an example of the scenario exposed above we have: If the full power of the licensed activity 4000 in. and the predecessor line test is 1000 in., the first gradual increase of to test power, would take from 5 to 10 minutes, proportional to  $\frac{1}{4}$  of the total time of gradual increase allowed (between 20 to 40 minutes). After this gradual increase, After the test was completed, another gradual (1000 pol<sup>3</sup>) to full power (4000 pol<sup>3</sup>). This second gradual increase correspond to  $\frac{3}{4}$  of the total time of the procedure (20 to 40 minutes), and may last between 15 to 30 minutes. Consequently, the seismic line would start at full power. In this way, it is suggested to complement the above topic, including test scenarios preceding lines:

*"If the test is performed with a power lower than the maximum used in the seismic survey, the duration of the gradual increase must be adjusted in employed in the test, to avoid shots noise emissions in the environment. In the case of previous tests at the beginning of seismic lines, the gradual increase between test and line should also be adjusted from proportional way between test power and full power. "*

#### **3.3.1. Equipment** - pg.12, Line 445 to 449 and 456 to 461.

*"The positioning of each MAP arrangement will depend on the stern configuration and each ship, but it is possible to establish some parameters, namely:*

- Minimum distance between hydrophones and stern: 200 meters or more.
- Minimum distance between pairs of hydrophones: 100 meters or more.
- Depth of operation: 20 meters or deeper. [...]

*Depending on the stern configuration, lateral drift can pose a significant risk of entanglement of the cables during the execution of maneuvers to change the seismic line. In these cases, to avoid interruption of the monitoring to change position of the MAP equipment, It is recommended to provide an equipment kit for each edge of the ship, allowing the unilateral gathering during the maneuver without prejudice to monitoring. "*

Considerations about the above equipment can not be generalized to different types of acquisition methodologies, such as 2D seismic (with a single seismic cable) and OBC / OBN (Oceanic Bottom Cable / Oceanic Bottom Nodes), where restrictions on

long / deep arrangements are different from those presented in 3D acquisitions with multiple seismic cables. It is suggested that the guide include an observation on the different methodologies, in order to preserve the understanding of different methodologies in the new independent of the deliberate during the licensing process.

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The depth of release is also suffers change with the length of it, since in a shorter cable, the need for more ballast to reach depth increases the stress on the MAP cable, increasing the chance of damage and / or considerably shortening the service life.

In some vessels, the reduced space makes it unfeasible to use or assemble a second MAP cable, and the availability of a towing point should be assessed or reel appropriate for its launch.

It is suggested that the guide should include a brief mention of the different acquisition methodologies seismic, assuring the possibility of proposing changes in equipment or applied methodology.

**3.3.1. Equipment - pg.13, Line 471 to 474.**

*"It is recommended to use the PAMGuard program to manage and since it has been developed collaboratively for years and is considered the open-source standard for passive acoustic monitoring in marine seismic surveys. "*

The Guide on line 436 indicates that the equipment and technologies used in monitoring should represent the state of the art. In order to ensure the longevity of the document mentioned above, the suggestion of *software* becomes inadequate, since IT solutions are in const update and renewal. It is suggested that the recommendation of a single program (ie, PAMGuard) is excluded from this guide and analyzed throughout the licensing, when IBAMA receives the Passive Acoustic Monitoring Project (PMAP), which will indicate the utility to be applied.

### 3.3.2. MAP operation - pg.13, Line 476 to 481.

*"The acoustic detection effort should occur 24 hours a day. Where the conditions acoustic monitoring shall be performed irrespective of whether the or not by firing the air guns, for example, during line, in case of technical problems of the sound sources or even during navigation between the port support and the area of activity [...]. "*

The equipment constituting the acoustic monitoring system has limits operational variables related to environmental and operational variables such as current velocity sea, ripples and trailing tension of the tow rope. The speed of the ship during between the base of support and the area of seismic survey, is usually at least twice the velocity of the seismic vessel during data acquisition, increasing

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the drag cable on the MAP cable, which could cause irreparable damage to the equipment.

It should be noted that the main function of MAP is to mitigate the effects of seismic activity, if the same to suffer wear when only of the traffic, it may not fulfill its main Function.

In addition, it is worth mentioning that during 3D seismic activity, to promote greater security to the MAP system, its cables are attached to seismic cables, thus dampening voltages and avoid possible entanglements, so it is not possible to perform the launch of the MAP cable before the end of the seismic cable launch, it will be attached.

In this same concept, the transit between nearby activities, if carried out with the arrangement of seismic cables in the water, would allow the use of the MAP arrangement, consequently enabling acoustic monitoring during these periods.

It is emphasized that if the cruising speed is reduced so that the MAP system supports the between the support base and the licensed area, there will be greater conflicts of use of maritime space. Since the MAP cables will be towed



densely populated and close to shore, maximizing interference with fishing craft and transit of ships and small vessels.

It is proposed to amend the abovementioned text to:

*"The acoustic detection effort must occur 24 hours a day, except for periods in which the operating conditions do not allow. It is suggested that acoustic monitoring, if possible regardless of whether or not the ship is firing the air guns, such as for example, during line switching maneuvers, in case of technical problems from the sources or during navigation between the port of support and the area of activity. If these scenarios are not performed, the final project report should indicate the inactive MAP the reasons for its suspension ... "*

### **3.3.3. MAP Records - pg.14, Line 549 to 552.**

*"[...] In the case of the scans prior to the beginning of the seismic lines, it is requested the audio file for the 30 minutes without detection, according to the procedure stipulated in this guide for audit purposes.*

Depending on the current seismic activity, the number of scans can reach easily the order of magnitude of  $10^2$ , approximately each scan takes up 3GB of records. The amount of digital material generated to be sent to IBAMA may require

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overwork analysts plus a large generation of waste *hardware* without an effective outcome for the scientific community or licensing body.

In addition, the MAP operator already fulfills the on-board fiscal function of the activity in vogue, such action would disqualify the assignments of the same, in addition to overloading its workstation.

It is suggested that only the scans carried out after the seismic activity detection of animals from the exclusion area are recorded and not all scans throughout the entire project. In this way, it is proposed to edit the text for the passage below:

*"[...] In the case of scans prior to the resumption of seismic lines linked to interruptions by detection of marine mammals in the exclusion zone, the*

*30 minutes without detection, according to the procedure stipulated in this guide, for audit. "*

**3.5. Records of biota monitoring - pg.15, Line 597.**

***" Operation Log Sheet and Monitoring Effort . "***

The "Record\_Operacao\_Esforco" tab of the spreadsheet attached to the Guide, due to the similarity of composition, was based on an operations EKMAN consulting company for a CGG project in Brazil. After experience for the use of the same by on-board observers and MAP operators, the need to insert a fill-in template and a step-by-step use. The worksheet is prepared for 10 daily activities and 5 ranges of visual effort and acoustic monitoring. If you ever differ from this initial premise, you should adapt the worksheet correctly for this scenario, otherwise the audible detection with shots "and" Observation time with shots "will value incoherent.

It should be noted that during the conversion of .xls (office-excel format) to *Libreoffice* (.ods) some features have been lost, such as alerts for scans less than 30 minutes and gradual increase of less than 20 minutes / greater than 40 minutes. These alerts are essential for quickly viewing fill-in or non-compliance errors procedures.

It is suggested that the worksheet be revised to insert the features listed above and that a step by step of use is inserted. If IBAMA is interested, the company

responsible for drawing up the worksheet (Ekman Environmental and Oceanographic Services) makes provision for its improvement.

**3.5. Records of biota monitoring - pg.16, Line 615.**

***" Sighting and sound detection logs "***

In the tabs "Record\_Aview" and "Record\_Detection" of the worksheet sent in an attachment to the Guide, the term "security area" is used, which is not defined and used in this new version. It is indicated to replace the term for "exclusion area".

**3.5. Records of biota monitoring - pg.16, Line 626 to 633.**

*"In the field assigned to the total time of interruption of the activity, the time must be in which the activity remained without firing the air cannons (downtime) due to some detection of biota. This includes the scanning and incremental time required to resume two shots. In the event of interruption of fire in which the Head of Operations decides not to resume as soon as possible, but initiate a change of line or other activity that does not involve the data collection, it will be the responsibility of MAP Observer and Operators to decide how much downtime must be effectively attributed to mitigation.*

It is suggested that the calculation of the interruption time be standardized to include only the time of mitigation of the activity related to environmental projects. In this way, the should cover the time the activity remained sound added to the minutes of scanning and gradual increase applicable. If the line is aborted by decision of the seismic team due to operational reasons and / or safety, this time should not be tied to environmental mitigation. Therefore, it is proposed to edit the passage transcribed for:

*"In the field assigned to the total time of interruption of the activity, the time must be in which the activity remained without firing the air cannons (downtime) due to some detection of biota. This includes the scanning and incremental time required to resume two shots. In the event of interruption of fire in which the Head of Operations decides not to resume as soon as possible, but initiate a change of line or other activity that does not involve the data, this range should not be effectively attributed to mitigation.*

**3.5. Records of biota monitoring - pg.16 / 17, Line 651 to 653.**

*"However, even in the case of electronic publishing, all worksheets should be printed and signed by the person responsible for filling it. [...]"*

The process of printing on physical media and later scanning of the recording and detection diverges with the new practices of the licensing body of reduction of paper usage and use of the SEI system. It is suggested that the signatures of

fillers are replaced by digital signatures  
 by electronic signature *software* such as Adobe or Clicksign.

In this way, it is suggested to edit the text to:

*"However, in the case of electronic publishing, all spreadsheets must have the signature responsible for completing it. [...]"*

### **3.5. Records of biota monitoring - pg.17, Line 658.**

#### **" General registration worksheet"**

The use of a single worksheet for records of the two projects, PMBM and PMAP, is not presented as an ideal, given the intrinsic differences to each type of biota monitoring. In addition, it is worth mentioning that sometimes the characteristics of sightings and detections concomitants are differentiated, such as the distances of the animals from the sources and the detection. The use of a single record linked to the two records may misunderstandings regarding the adoption of mitigations.

In addition, the indicated registration worksheet does not provide any explanation and does not insert the information if visual monitoring was active when the the time of an acoustic detection and vice versa, essential information for the discussion of projects. It should be noted that the single register also does not cover required for entry into SIMMAM.

In this way, it is suggested that there be a differentiated worksheet for each project that essential information for each one, considering their peculiarities. Like for example, the fields of characteristics of the acoustic signals are primordial and exclusive to the PMAP, while the behavioral fields and number of groups of individuals are linked only to PMBM. General Spreadsheet Spreadsheets and the General Spreadsheet of suggested detections are found in the [Appendix II](#) .

### **4. Marine Biota Monitoring Report - pg.17, Line 670 to 671.**

*"The report of the monitoring of the marine biota must be delivered printed and in digital medium, with the exception of the spreadsheets indicated as exclusively digital. [...]"*

The request to submit the final report of the project in printed form goes against the new practices of the licensing body for paper usage reduction and use of the system KNOW. It is suggested that the report be delivered only in digital format, modifying the

passage transcribed to:

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*"The marine biota monitoring report and the monitoring record sheets of the biota must be delivered in digital media. "*

**4. Marine Biota Monitoring Report - pg.17, Line 681 to 686.**

*"- Presentation of the occurrence data of marine biota in digital media, in archives shapefile (.shp). The shapefiles should be referenced in the SIRGAS 2000 projection and contain a table attribute based on the General Record Worksheet. That is, each point should be associated with the sighting / detection information as set out in the consolidated worksheet. "*

The delivery of a single *shapefile* pertaining to the PMBM and PMAP data dates the request the use of a single general registration worksheet for the two projects. As demonstrated previously, the adoption of a single spreadsheet for projects with specific characteristics not an ideal and facilitating tool for information.

In a way analogous to the suggestion of the use of two general registers referring to each project, one linked to the PMBM and another to the PMAP, it is proposed to present two *shapefiles* in the final report, with attributes similar to the worksheets presented in [Appendix II](#) .

**4. Marine Biota Monitoring Report - pg.18, Line 701 to 706.**

*"- Calculation of total" frequencies of sighting "and by species / group per unit of time (100 hours), that is, the number of sightings per observation effort unit;*

*- Calculation of total "acoustic frequency" and by species / group per unit of time (100 hours), ie the number of sightings per observation effort unit. "*

Please ask for clarification on the use of this statistic. Why is there delimitation of 100 hours, since this period does not include exact measurement of the unit usually used for 1 day (24h)?

[Appendix I - Indications of the use of the jargon "air cannons" and "shots" throughout the Guide.](#)

• *"air cannons"*

The jargon "air cannons", currently in disuse by the industry, had been used several times following pages / lines.

- Pg.03 - Line 14; Line 39; Line 39/40;
- Pg.04 - Line 78; Line 78;
- Pg.05 - Line 104;
- Pg.06 - Line 143;
- Pg.07 - Line 189; Line 207;
- Pg.08 - Line 236;
- Pg.09-Line 304;
- Pg.10 - Line 313; Line 320; Line 326; Line 332; Line 333; Line 350; Line 351
- Pg.13 - Line 478;
- Pg.15 - Line 573;
- Pg.16 - Line 627; Line 643; Line 646;
- Pg.18 - Line 709;

As presented in Item 1.1. Objectives, it is suggested that throughout the Guide terminology "air cannon" by "seismic source".

• *"shots"*

The jargon "shots", currently in disuse by the industry, had been used several times in the following pages / lines.

- Pg.03 - Line 14; Line 28; Line 32;
- Pg.04 - Line 46; Line 54; Line 56; Line 59;
- Pg.05 - Line 114; Line 115; Line 116; Line 124;
- Pg.06 - Line 140; Line 140; Line 145; Line 153;
- Pg.09 - Line 304; Line 306;
- Pg.10 - Line 311; Line 312; Line 321; Line 322; Line 332; Line 334; Line 347; Line 354;
- Pg.11 - Line 360; Line 374; Line 376; Line 392; Line 402;
- Pg.12 - Line 406; Line 408;
- Pg. 14 - Line 517; Line 553;
- Pg. 15 - Line 573;

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- Pg. 16 - Line 629; Line 630;
- Pg. 18 - Line 696; Line 699; Line 700.

As presented in **1.1. Objectives, it is** suggested that throughout the Guide the terminology "Shots" is replaced by "noise" or only "emissions".