IPPC Delimara Power Station: Noise Method Statement – ElectroGas Malta

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Revision History

Version	Revision	Date	Purpose/Status
01	01	17/06/2016	Draft release.
01	02	20/06/2016	Errata.
01	03	22/06/2016	Errata.
01	04	13/07/2016	Change on FSU operation.

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Definitions

Title	Description	Abbreviation
Delimara Power Station Phase 1		DPS1
Delimara Power Station Phase 2A		DPS2A
Delimara Power Station Phase 2B		DPS2B
Delimara Power Station Phase 3		DPS3
ElectroGas Malta		EGM
Enemalta plc		ENE
Delimara 3 Power and Gas		D3PG

1. Introduction

The objective of this document is to describe the methodology for monitoring, assessment, and reporting of noise emissions from the Delimara Power Station site using best practicable means (BPM) so as to fulfil the following requirements:

- Assess the likelihood of complaints at noise sensitive receptors resulting from noise emissions generated by all three operators from the Delimara Power Station Site.
- To fulfil the EIA required for the development of EGM's installation as described in PA0021 and PA 0022 of 2014, monitoring of the areas noted in said EIA is required. The resulting changes brought in by this additional plant will be reported to the environmental authority. This would be an initial or one time exercise to establish whether the new plant fits within the present levels and will provide a basis for future comparative analysis.
- Measure the noise emissions at source generated by the ElectroGas Malta operated plant within DPS Site, the results of which will be presented in a noise contour map. This contour map will be used in the case of abnormal nuisance detected from the DPS site (during the annual monitoring or otherwise). Hence it will be used as a guide in establishing whether the nuisance noise at receptors is emitted from ElectroGas Malta operated plant within the DPS site.

2. Description of the environment

Prior to describing the proposed methodology it is first necessary to understand the operational environment in which it is to be applied.

2.1. Delimara Power Station Site

To date the DPS has been operated by a single operator, Enemalta plc. Following the construction of DPS4 and the conversion of D3 to operate on gas, the DPS site shall house Enemalta plc (ENE), ElectroGas Malta (EGM) and Delimara 3 Power & Gas (D3PG) – *see Figure 1*. The introduction of EGM's installation will see an increase in the existing DPS site boundary, when considering the FSU and re-gas facilities. As part of the EIA carried as a requirement of the development permit applications PA/00021/14 and PA/00022/14, an assessment of the expected combined noise emission from the DPS site was carried out so as to determine the combined potential impact of noise generated by all three operators. This was done by taking measurements of existing plant on site, determining the noise emissions of the proposed plant and through the use of computer modelling software create a series of

noise contour maps which could be used to assess the combined and individual impact of each plant. Figure 2 below shows an example of one such noise contour map.

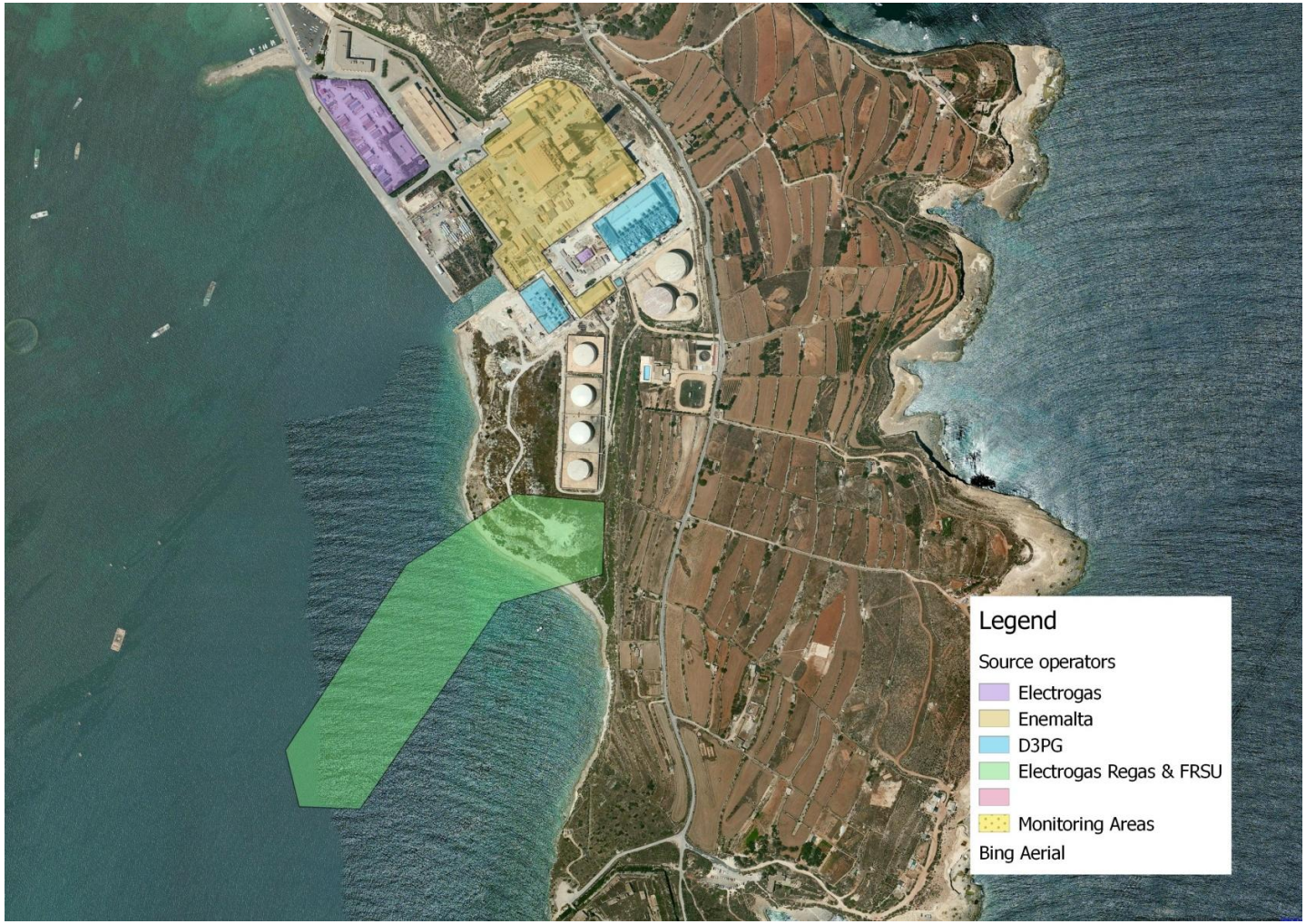

Figure 1 The operators within the Delimara Power Station site.

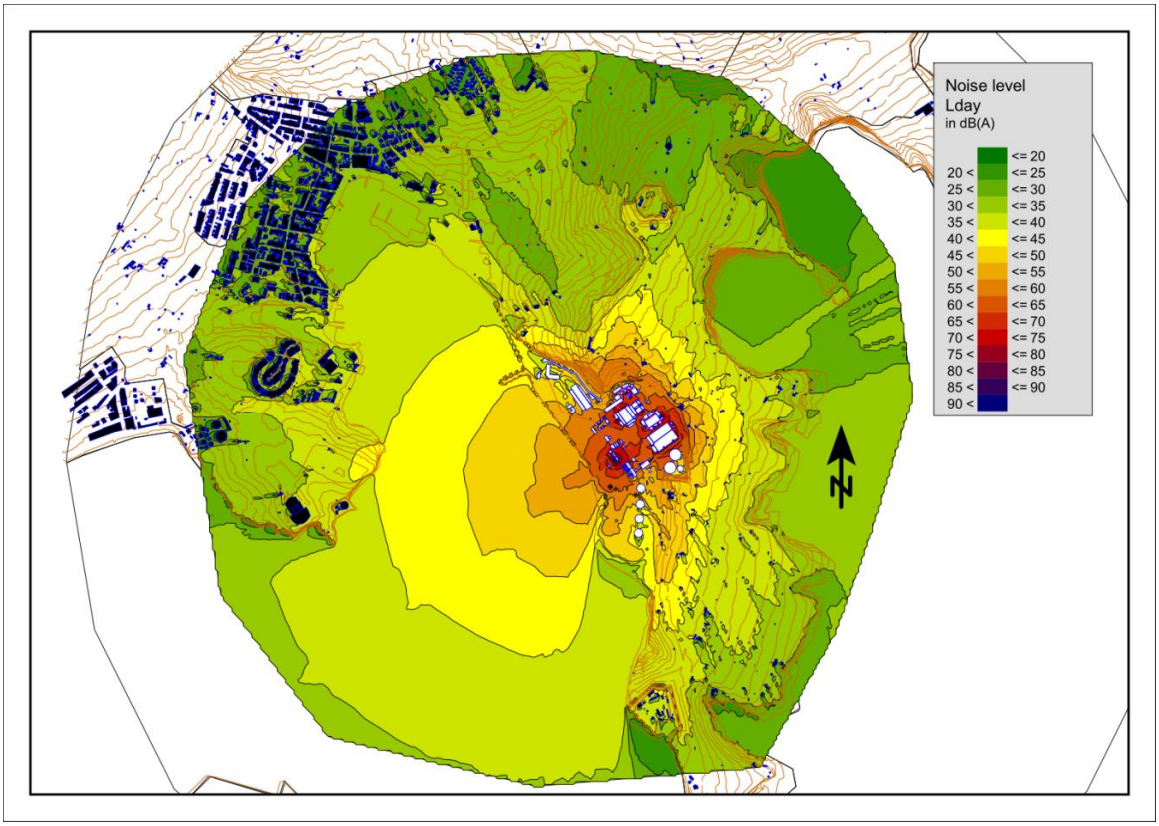

Figure 2 Sample noise contour map.

2.2. Electrogas operated plant

As one of the new operators to the site, ElectroGas Malta will be responsible for the operation of;

- DPS4, consisting mainly of three closed cycle turbines and a steam generator,
- The Floating Storage Unit, otherwise described as the FSU,
- The Regas plant, for the regasification of LNG from the FSU,
- The Gas Regulating Station, for the final delivery pressure to both DPS3 and DPS4,
- All of the gas delivery pipework to and from DPS3 and DPS4.

DPS4 will also be supported by;

- demineralized water from ENE storage tanks,
- sea water pumps from ENE's main sea water inlets,
- And, a waste collection area.

3. Methodology for monitoring.

To fulfil the three objectives described in section 1, two different methods of approach are required.

3.1. Method 1: Far-field Noise Measurement Monitoring

3.1.1. Objective

To assess the likelihood of complaints at noise sensitive receptors resulting from noise emissions generated by all three operators from the Delimara Power Station Site.

3.1.2. Monitoring methodology

Physical monitoring at remote off site locations during operation shall be utilized. As per previous assessments it is being proposed that BS 4142:2014 shall be implemented with the following changes:

- Previous noise assessment periods using BS 4142:1997 may have resulted in noise measurement uncertainty due to limited measurement time periods and inaccurate measurement of the back ground noise. Such short periods do not represent the source and its possible rating for nuisance. So as to resolve this issue it is being proposed that yearly monitoring at pre-established receptors shall be taken, as indicated in figure 3, however longer time measurement periods shall be utilized to provide better data quality.
- For the purpose of calculating the future Rating level, a suitable background noise level over which a comparison will be made throughout the years is required. A noise monitoring survey in a set of pre-established receptors (noted in figure 3 below) shall be taken in 2016, before D4 plant is put in operation whilst DPS1, DPS2B and DPS3 are in operation, to establish both the background sound level ($L_{A90,T}$ Year 2016) and the ambient noise level L_a ($L_{Aeq,T}$ Year 2016) according to BS4142:2014.
- This shall be calculated as follows: The background sound level ($L_{A90,T}$ Year 2016) and the ambient noise level L_a ($L_{Aeq,T}$ Year 2016) according to BS4142:2014 will be measured. This in turn will be used for the future rated specific noise level detection and comparison.
- On a yearly basis, the 3 companies at DPS site shall commission a noise survey where the noise rating, $L_{eq\ (YEAR\ n),}$ at the same pre-established receptors will be monitored over a minimum period of 3 days. These 3 days will then be subdivided into periods for the assessment to be carried out according to BS4142:2014 and rated accordingly.
- This rating level $L_{Aeq,Tr}$ (Year n) shall be deducted to the background noise measured in 2016, $L_{A90,T\ YEAR\ 2016}$. Where it is established that the difference between the background noise calculated in 2016 and the rating level calculated in year n, referred to Delta $L_{eq\ (YEAR\ n),}$ is exceeding 5dB, the assessor shall verify whether the noise signature in that particular moment was attributable to DPS site using the previous

contour maps and noise signatures. A difference between background noise in 2016 and rating level in year n (Delta $L_{eq\ (YEAR\ n)}$) that will be attributable to DPS will be used to check for non-conformity. The assessor, utilizing the signatures of the noise and the contour map shall identify whether Delimara Plant was responsible for the non-conformity and report accordingly. The assessment shall indicate at which time a specific plant was put in service (if required from an operational point of view) and according to the noise signature of each plant, the assessor shall determine whether there was an increase in the noise level once the unit was in stable operation and whether any noise increase is attributable to specific plant being in service. For the purpose of the annual monitoring DPS Site, other than phase 2A and 2B, shall be requested to operate in its normal operation mode.

- It is being recommended to monitor a period of 3 consecutive days subdivided into periods according to BS4142:2014 in order to have a representative Rating Level indicative of any increase in noise as compared to 2016 and whether this increase is attributable to DPS site. The present background levels in 2016 (i.e. prior to D4 coming into operation) will be used to determine the rating level. If the difference is less than +5db there will be no actions required from ElectroGas Malta.

3.1.3. Monitoring frequency and location

Physical monitoring is to be carried out annually at the noise sensitive receptors. It is being suggested to measure the rating noise $L_{Aeq,Tr}$ (Year n) in the areas noted below in Figure 3, .

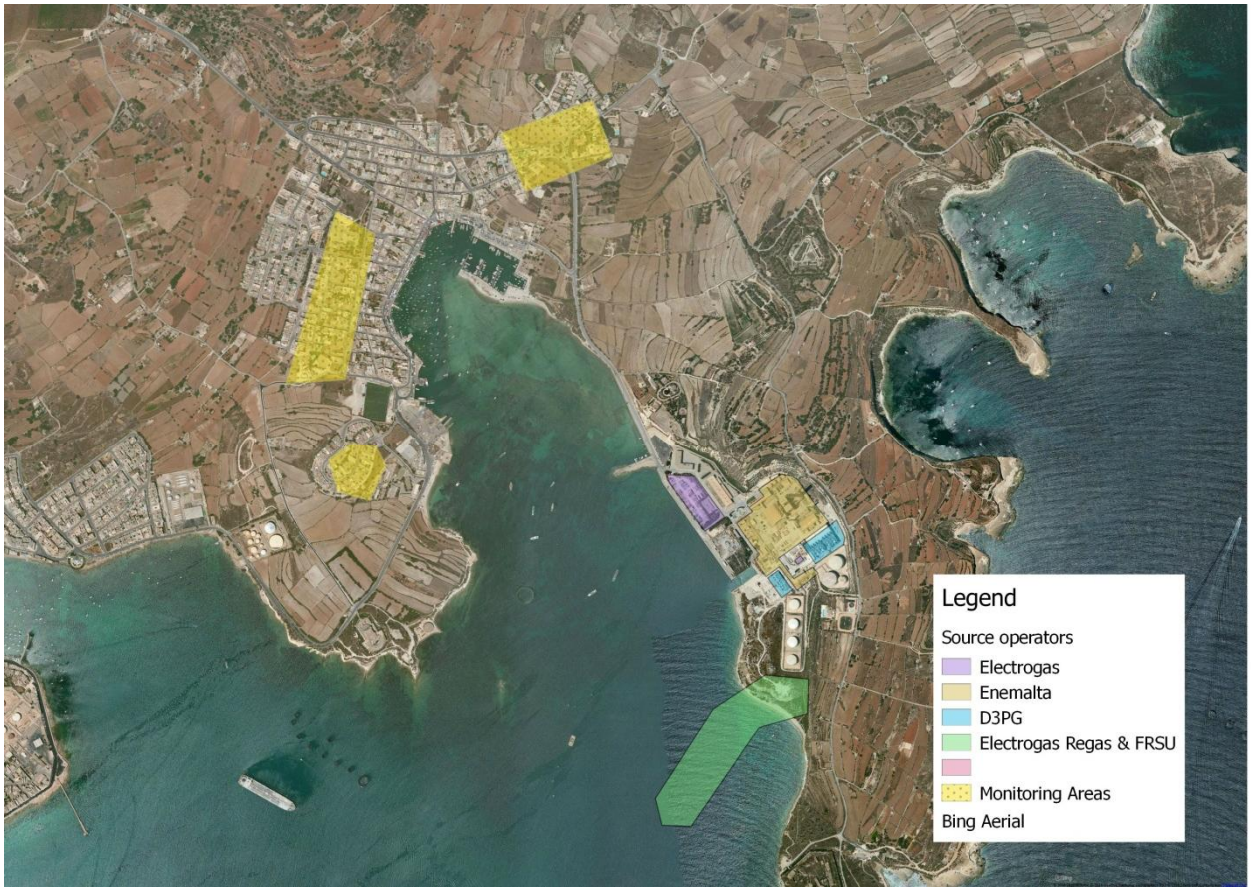

Figure 3 Areas for physical monitoring (marked in spotted yellow).

3.1.4. Interpretation of results

Measurements being taken over a period of three days will be subdivided into periods for assessment according to BS4142:2014 and rated accordingly. The results of which will be presented in a table and a rating level, $L_{Aeq,Tr}$ (Year n) attributable to DPS will be reported on according to clause 11 of BS4142:2014.

Monitoring of the site does not only involve noise level measurement but also the review of operational emissions as a paper study. Previous documents involved the heavy use of sound pressure measurements in locations, both on-site and off-site, which could not always be directly connected to the operation of the site or the site's emissions. Hence, it is being suggested that the annual monitoring of the actual emissions from the area is evaluated based on any possible changes to the equipment. This would also need to take into consideration what is happening between the sources and the final receivers or NSPs if any major physical changes occur in the locality. Hence the source-path-receiver would have to be considered to decrease the uncertainty of the present or future situation with regards to the site vis-à-vis the surrounding environment. These parts of the noise climate are handled in different ways using different standards applicable to the type of argument handled. Thus, in case the Rating Level in a specific year n,

$L_{Aeq,Tr}$ (Year n) exceeds the background noise level as calculated in 2016 by +10dB and the source of this exceedance cannot be established, a comparison between noise mapping in method 2 in that specific year as compared to the contour of 2016 shall be carried out. If the noise mapping exercise in year n is within +/- 3dB, it shall be considered identical to that of 2016, and no further action will be required from ElectroGas Malta. However, if the new contour identifies a source within DPS site and which noise increased by over +6dB from the original contour the faulting party shall be required to rectify to enter within the previous contour. Once the corrective action is taken, an assessment of the noise at receptors shall be taken, however the duration of the test shall only be 3 hours during the day and 1 hour at 3am and ENE's DPS2A and 2B shall not be in service (if they were not the source of the emission). The costs of the new contour map/s and retest at receptors shall be borne by the operator who was not conforming to the +3dB Delta $L_{eq\ (YEAR\ n),}$ in line with the polluters pay principle.

3.2. Second Method: EIA monitoring

ElectroGas Malta will be putting into operation DPS4 as completely new plant to the DPS site. Since this will be the first IPPC licensing for the project, it is imperative that certain comparative measurements are done for the new plant being introduced.

3.2.1. Objective

The objective for this part of the exercise is to make measurements post start up to compare to the levels determined or measured during the EIA process. This exercise is considered to be a one-time objective, solely to gauge whether the EIA parameters have been met.

During the EIA exercise, a number of week-long measurements were done to establish the situation at the time and this used for comparison to a number of predictions or simulations done to gauge the possible impact from the additional plant to be introduced. In the EIA a number of possible long and short measurement positions were suggested (EIS Addendum ver. 2) and also some measurements were done by a Siemens representative during the night as other project guidance values. The simulations included possible noise sources on the FSU (Floating Storage Unit).

Since DPS4 is going to be put through various initial operating phases until full and stable operation is reached, it is required that these measurements are also redone at a later date. Primarily, because for the first few months the gas turbines will be operating in open cycle and the FSU will have to be a fully operating ship i.e. with on board engines boilers etc. operating as required until shore power can be safely introduced.

The measurements required of this part of the IPPC licensing and also shown in Figure:

- External suggested EIA points both long and short,
- External short period measurements in the locations taken by Siemens representative,
- FSU - before and after the FSU is introduced to the location

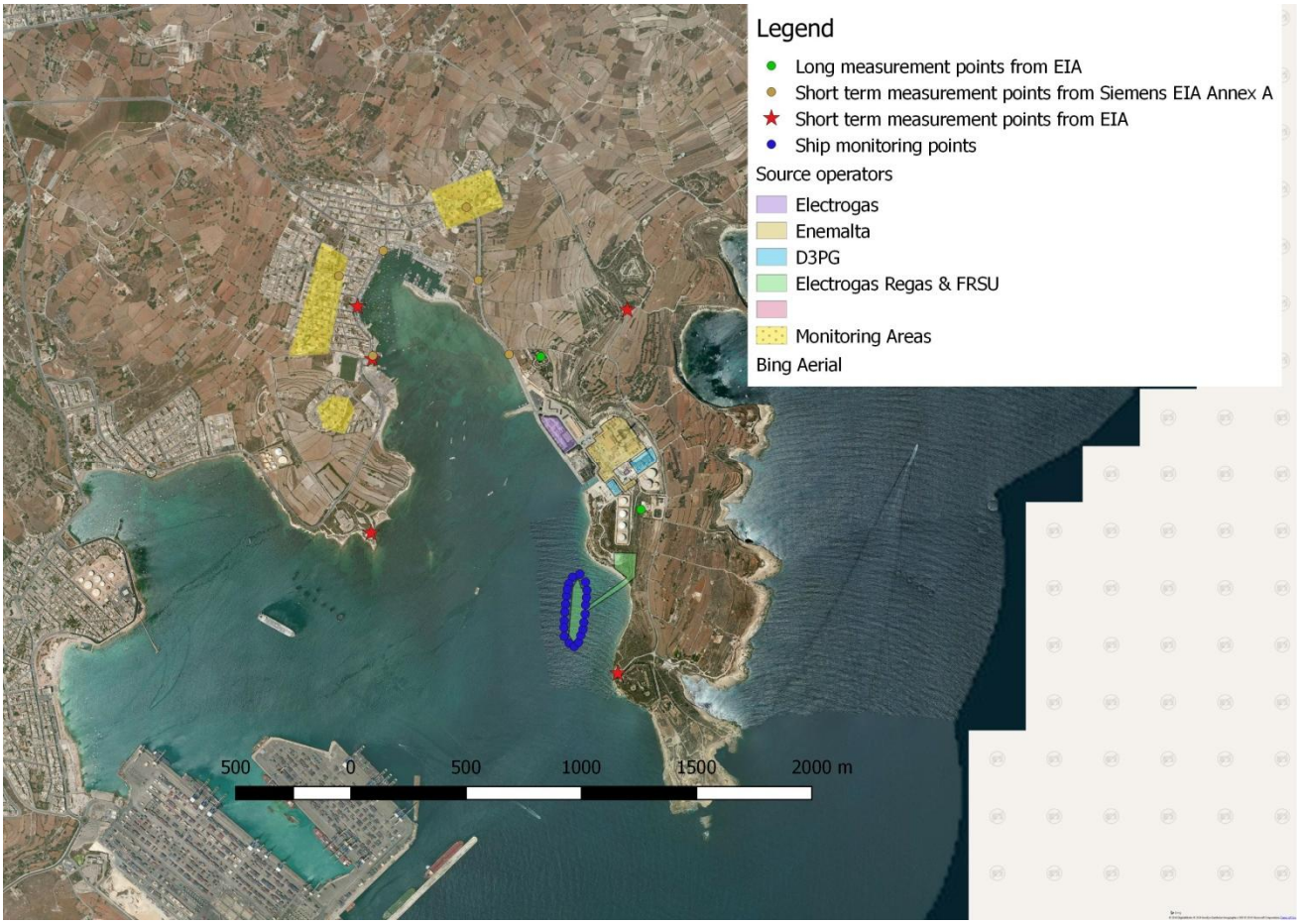

Figure 4 Additional 'one time' monitoring positions required for DPS4.

3.2.2. External EIA monitoring positions

In EIS Addendum provided in 2014, a number of monitoring positions were suggested to gauge the change or possible impact from DPS4 to the local environment. These consisted of:

- Six monitoring positions to be measured with periods of an hour diurnally and short night time periods of 30 minutes. Measurements need to be done both prior to operation and after start up.
- And, two monitoring positions measured over a period of days to a week that would be compared to the measurements done at EIA stage at the same locations.

3.2.3. Siemens comparative monitoring points

A Siemens representative had previously taken a number of short periods -5 minute- L_{AS}, $L_{AS90\%}$ and $L_{AS99\%}$ measurements at six locations for a comparative basis to establish the possible impacts in relation to the initial predictions. These measurements will be done at the same time i.e. between midnight and 02:00 in the morning. The results will be compared to the previous measurements taken beforehand.

3.2.4. FSU emissions

At EIA stage the individual noise sources expected from the FSU were modelled for a situation whereby the FSU was to operate on shore power. Due to circumstances of operation, safety and reliability of supply, the FSU will initially operate with on board supply and active lower deck machinery e.g. boilers for regasification purposes, on board generator etc.

Although many projects[1] have been done to find ways of measuring ships in harbours or ports, all lack a definitive way of representing the impact of operational ships within harbour areas as mostly are dealing with noise on board. The only standard that can be used to declare the emissions from the ship/FSU is EN ISO 2922:2000 "Measurement of airborne sound emitted by vessels on inland waterways and harbours". Hence a number of measurements according to said standard will be made prior to the FSU being in place to define the background noise in the locality. The same set of measurements will be done when the FSU is in operation – see Figure 5.

The number of measurements made and locations will depend on the final size and location of the ship. These measurements will be made to declare the emissions of the ship to the locality. The results will be presented as such but might also be used in Method three of this document should access to the individual noise sources be impossible due to ATEX restrictions. In which case, a method of extracting directional information from the results will be included.

[1] European Neighbourhood and Partnership Instrument Cross-Border Cooperation Mediterranean Sea Basin Programme (ENPI CBC MED) MESP Project "Roadmap on Sustainability Criteria: Guide-lines for Port Environmental Management"; SILENV (Ship Innovative soLutions to rEduce Noise and Vibrations: www.silenv.eu); International Maritime Organization (IMO) older Resolution A.468 (XII); new Resolution MSC.337 (91) etc.

Figure 5 FSU measurement points.

3.3. Third Method: Noise mapping exercise.

3.3.1. Objective

To measure the noise emissions at source generated by ElectroGas Malta plant, to create a noise contour map so as to verify where the plant might have effects on the local communities and what average levels are expected to be contributed to the local environment from the ElectroGas Malta plant within DPS Site.

3.3.2. Monitoring Methodology

The Sound Power Level emissions are measured and mapped using software with day and night periods according to ISO1996-2 propagation in all directions from the site, giving a clear picture of the contribution made by equipment to the area.

The noise model used in the Phase 4 EIA will be used to present the data of emissions from the DPS site. The inputs will be the source sound powers with ISO 1996-2 propagation model to the receiver sites and the statistical 50 year weather data of Malta. It is intended to supplement the model with a finer DGM from the LIDAR data supplied under ERDF 156 data, (2013), *Developing National Environmental Monitoring Infrastructure and Capacity, Malta Environment & Planning Authority*.

The three main components of the noise model are the noise sources, the source-receiver path and the receivers/NSPs.

3.3.2.1. Noise Sources

Considering the various types and size of noise sources on DPS site, operations and equipment will be handled using the following standards.

In all sections of the EIA 2013/2014 regarding Phase 4, the use of ISO 9614-2 was used for different parts and sections of the DPS site. But, if some sections will become impracticable due to space requirements or ATEX restrictions and/or ongoing changes, use of the ISO 37XX series of standards will be used for smaller sections of the site, namely the preferred ISO 3744 or the survey method ISO 3746. Sound power level derived from sound intensity measurements on specific parts of the power station site will be done according to ISO9614-2. This is the preferred method for data collation to be entered in the area model for representation.

3.3.2.2. Path Modelling

The path between the sources and receivers will be determined and corrected according to ISO1996-2. Considering the data quality obtained during the EIA process, tonality might be assessed.

3.3.2.3. Receivers/NSPs

Cumulative day and night predicted noise levels from DPS4 equipment will be presented in the form of a noise map. The area to be covered is circa 12.5 square kilometres.

3.3.3. Monitoring frequency

This assessment is to be a one-time assessment and shall be a base study for future comparative assessments. It is being suggested that should any other circumstance imply a major equipment change at the DPS Site such assessment will be reviewed and any changes thereof declared. This exercise should be done once the full commissioning of DPS4 is concluded. This assessment is to be used in future comparative analysis.

3.3.4. Interpretation of results

The results of this assessment shall be presented in the form of noise contour maps

Should the annual monitoring from method 1 using BS4142:2014 signal a +6db increase or more over the previous background noise, and the origin of this increase is attributable to DPS4 plant within the DPS site, a new sound power measurement exercise on the relative equipment will be performed and the resulting new noise contour map compared to the one submitted in the initial IPPC application, or as updated from time to time if any new equipment updated or changed brings about a significant change so that the origin of the new noise change would be determined.

Should the noise emissions from DPS Site remain unchanged (or within +5 dBA) from the latest contour map submitted to ERA, DPS site shall be considered to be in conformity and within acceptable noise emission levels.