



KM3NeT INFRADEV – H2020 – 739560

An environmental study for KM3NeT-Fr/ORCA

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Abstract

The ORCA seafloor network is located at about 40 km South of Toulon, France. The detector is installed in the Exclusive Economic Zone while the main cables are mainly installed in the territorial water. Such sub-marine infrastructure requires authorizations defined by French laws for the installation. The document reports on the process followed to obtain these authorisations with a focus on the environmental impact.

I. COPYRIGHT NOTICE

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II. DELIVERY SLIP

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III. DOCUMENT LOG

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IV. APPLICATION AREA

This document is a formal deliverable for the GA of the project, applicable to all members of the KM3NeT INFRADEV project, beneficiaries and third parties, as well as its collaborating projects.

V. TERMINOLOGY

AOT: Autorisation d'Occupation Temporaire
 CMF: Comité de Façade Méditerranée
 CODERST: Conseil Départemental de l'Environnement et des Risques Sanitaires et Technologiques
 DDTM: Direction Départementale des Territoires et de la Mer



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DPM:	Domaine Public maritime
DREAL:	Direction Régionale de l'Environnement, de l'Aménagement et du Logement
DU:	Detection Unit
EEZ:	Exclusive Economic Zone
EPCI:	Etablissement Public de Coopération Intercommunales
EMSO ERIC:	European Multidisciplinary Seafloor and water column Observatory
ESS:	Earth and Sea Sciences
KM3NeT:	Kilometer cube Neutrino telescope
ORCA:	Oscillation Research with Cosmics in the Abyss
RAA:	Receuil des Actes Administratifs
RI:	Research Infrastructure
ROV:	Remotly Operated underwater Vehicle
SHOM:	Service Hydrographique et Océanographique de la Marine

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VIII. PROJECT SUMMARY

KM3NeT is a large Research Infrastructure that will consist of a network of deep-sea neutrino telescopes in the Mediterranean Sea with user ports for Earth and Sea sciences. Following the appearance of KM3NeT 2.0 on the ESFRI roadmap 2016 and in line with the recommendations of



the Assessment Expert Group in 2013, the KM3NeT-INFRADEV project addresses the Coordination and Support Actions (CSA) to prepare a legal entity and appropriate services for KM3NeT, thereby providing a sustainable solution for the operation of the Research Infrastructure during ten (or more) years. The KM3NeT-INFRADEV is funded by the European Commission's Horizon 2020 framework and its objectives comprise, amongst others, environmental impact studies for all existent and potential installation sites (WP5).

IX. EXECUTIVE SUMMARY

The installation of a submarine infrastructure in the territorial waters of the Domaine Public Maritime and the Exclusive Economic Zone of France have to follow rules and regulations to obtain authorization of installation. The main issue is the impact of the installation on the environment. The document describes the process followed with the results.

The KM3NeT group in CPPM, Marseille, is in charge of conducting an environmental study at the KM3NeT-Fr site off shore Toulon, France. The group has ample experience in conducting such a study and apply for permission for deployment for the ANTARES neutrino telescope in the same area. The same procedures were followed to gain permission for deployment of KM3NeT. The permissions were granted and an electro-optical cable connecting the deep-sea network and the shore station in La Seyne sur Mer has been installed. The first node of the deep-sea network is also installed and the first Detection Units are deployed and connected to this first node. New deployment campaigns are scheduled for 2020 and beyond.



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1. Introduction

The French Research Infrastructure (RI) is a deep-sea infrastructure located at about 40 km South of Toulon, France at 2450 m depth. A KM3NeT/ORCA neutrino detector for physics research and some instrumentation for Earth and Sea Sciences (ESS) mainly associated to EMSO ERIC compose the RI. The instruments of the RI are located in the Exclusive Economic Zone (EEZ) while the main cables to link the RI to the shore are mainly installed in the territorial waters, part of the Domaine Public Maritime (DPM). Such RI requires, for the installation, authorizations defined by French laws and regulations.

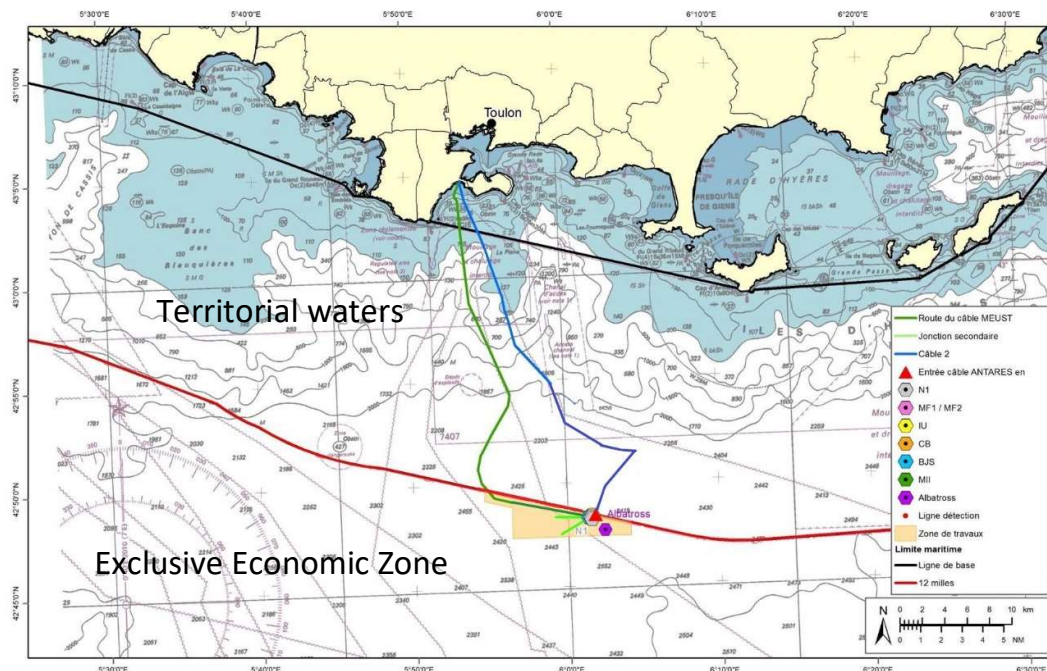


Figure 1: Location of the Research Infrastructure KM3NeT/ORCA

2. Plan

KM3NeT needs to present environmental studies taking into account regulations and procedures defined at the European and National level to install the RI. The environmental impact assessment of the KM3NeT installation sites is done through the procedures for obtaining the authorizations of installation of the RI. For ORCA, these procedures defined by the French laws and regulations are instructed by the Maritime Prefecture office and the Direction Départementale des Territoires et de la Mer (DDTM). We have to follow a process, based on a documentation that includes an impact study, with the examination by different committees. The documentation is realised with the help of an environmental engineering office. At the end of the process the authorisations are given in the form of prefectural decrees.

The plan is to obtain the authorisation for an ORCA building block, perform a monitoring of the impact on the environment as defined by the initial prefectural decrees and regularize the ANTARES cable. The impact study of the INFRADEV project is the continuation of the complex process started at the beginning of the project, this is why the anterior works is described here to have a complete view of the process.

3. Content

The French RI is designated to host a neutrino detector so-called ORCA (Oscillations Research with Cosmics in the Abyss) in the context of the KM3NeT Collaboration and Earth and Environmental Sciences instruments in the context of EMSO ERIC, a European network of submarine observatories. The deep-sea part of the RI is located ~40km offshore of Toulon at a depth of 2450m at the coordinates 47°48.3'N and 6°01.7'E. It is located in the EEZ and linked to the shore at La Seyne sur Mer by 2 main cables mainly installed in the DPM. The shore part of the RI comprises a power station located close to the beach and a control room about 1.5 km away.

The installation of such infrastructure in the EEZ and DPM in France is subject to authorizations according to the French regulations. The regulations are now almost the same for the 2 areas and lay to conduct in parallel 2 types of procedures to request authorization of installation on the DPM and in the EEZ. It has to be noted that the later one was added during the process due to the publication of new French regulations for the EEZ (to be treated almost like the DPM). In addition the pure environmental aspect in the DPM is handled through 2 procedures "Examen au Cas par Cas" and "Loi sur l'Eau". The final authorizations are given by the local authorities, "Préfet du Var" and "Préfet Maritime de la Méditerranée", through prefectural decrees. The complexity of the procedures requires the help of specialized companies in environmental engineering to define the content of the documentation according to the laws, to perform the impact study required and finally release the document. A tender was released to select the company. The contract was awarded to SETEC IN VIVO, a company base in Brest with an office close to Toulon. The company SETEC IN VIVO is a design office specialized in oceanography and marine environment: oceanography, hydrography, geophysics, sedimentology... Impact studies, ecological monitoring, project management and maritime engineering, R&D. Oceanographic measurements and studies, marine biology. Ornithology. Environmental studies: Natura 2000 sites, impact studies, clean ports, GHG assessments. Ecological monitoring. Project management and maritime engineering.

The procedures imply to evaluate the impact on the environment during the construction, the operation and the dismantling phases of the detector. The impact study concerns the impact of the infrastructure on the sea water, fishing activities, marine mammal populations, military activities, "Natura 2000" sites, "zones naturelles d'intérêt écologique, faunistique et floristique" with in particular the posidonia meadows (protected species), tourism activities, biological communities and archaeology. The study required some in situ survey and the collection of some samples to have an initial status as reference.

In addition to these procedures, an authorization from the Maritime Prefect is required to install a permanent acoustic system (hydrophones) in the EEZ.



A simplified flow chart of the procedures is given in the figure 2.

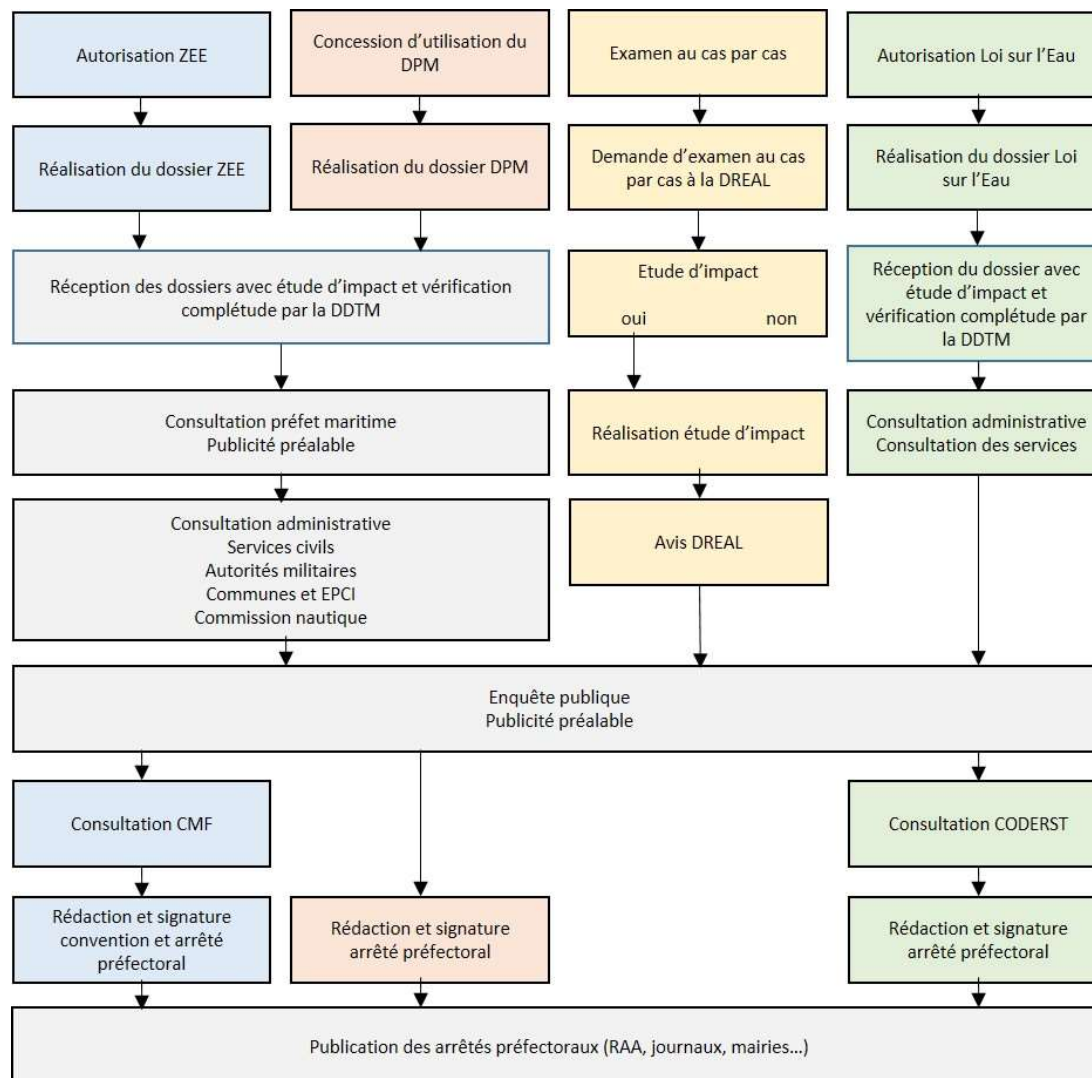


Figure 2: Flow chart of the procedures

This work was done in 2 phases: the prototype phase to start building the infrastructure and the phase 2 for a full KM3NeT building block, both with some ESS instrumentation.

The table 1 summarises the main actions and dates described in the following paragraphs during the procedures.

Procedure	Action	Date	Comments
DPM-Ph1	Start of the procedure	03/2013	Writing of the documentation
	Documentation release to the DDTM	07/2013	
	Commission nautique	12/2013	
	Public enquiry	05/2014	
	Release of prefectural decree	09/2014	
	Release of modified prefectural decree	05/2017	
ZEE-Ph1	Start of the procedure	10/2013	Writing of the documentation
	Documentation release to the DDTM	11/2013	
	Public enquiry	05/2014	
	CMF	06/2014	
	Release of prefectural decree	09/2014	
	Release of modified prefectural decree	05/2017	
Loi sur l'Eau	Start of the procedure	03/2013	Writing of the documentation
	Documentation release to the DDTM	07/2013	
	Public enquiry	05/2014	
	CODERST	07/2014	
	Public enquiry	05/2014	
	Release of prefectural decree	07/2014	
ZEE-Ph2	Start of the procedure	09/2016	Writing of the documentation
	Documentation release to the DDTM	01/2017	
	CMF	06/2018	
	Release of prefectural decree	09/2019	Modification of the original one

Table 1: Main steps and dates during the course of the procedures

3.1 Prototype phase

The prototype phase concerned the installation of:

- one main electro-optical telecommunication cable linking the RI to shore,
- one node of the submarine infrastructure,
- one Detection Unit (DU) of the KM3NeT/ORCA detector,
- Two ESS instruments (an Interface Instrumented Module MII and an instrumented line ALBATROSS).



Later, we asked a modification of the prefectural decree to add 6 more DUs. The map of the equipment installed in this phase is given in the figure 3.

The procedure to follow are:

- Authorization of installation in the DPM
- Authorization of installation in the EEZ
- “Examen au Cas par Cas”
- “Loi sur l’Eau”
- Installation of a permanent acoustic system

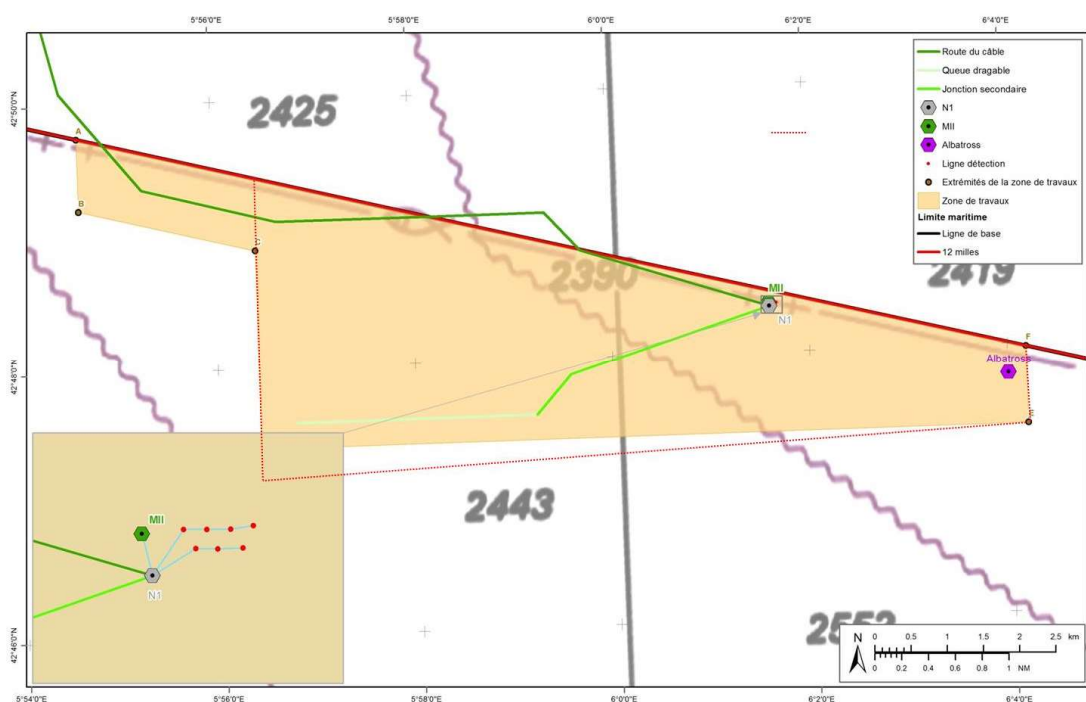


Figure 3: Installation map of the equipment in the prototype phase

We submitted the documentation for the “Examen au Cas par Cas” procedure to the « Direction Régionale de l'Environnement, de l'Aménagement et du Logement » (DREAL). The examination of the dossier and the work concerned led the DREAL to exclude this dossier from the scope of the impact assessment but they requested a study on the impact on two “Natura 2000 sites” as well as a derogation to install the main cable on the posidona meadows close to the beach.

The 3 others procedures were conducted in parallel with the realization of a document for the DPM [1], the EEZ [2] and “Loi sur l’Eau” [3]. For these documents, a visual survey by a submarine vehicle (ROV) of the cable route from 100 m to 600 m depth was performed to identify the species present along the cable route and some sample of sediments were collected close to the shore and analysed. The documents were provided to the DTTM on July 2013 for the DPM and Loi sur l’Eau and in November 2013 for the EEZ. During the procedure, different committees: nautical, fishermen, “Comité de Façade Méditerranée” (CMF), “Conseil Départemental de l’Environnement et des Risques Sanitaires

et Technologiques” (CODERST) were successfully consulted and a public inquiry was conducted in La Seyne sur Mer and Carqueiranne towns. The main conclusion of the impact study and of the different committees is that the impact on the environment as well other marine activities are negligible or limited. Moreover, the project itself is a monitoring system with the different instrument sensors installed and readout in real time.

At the end of the process, two prefectural decrees were released in July and September 2014 to authorize the installation with some recommendations for the construction, especially for the cable crossing the posidonia meadow, and asking a survey in terms of environmental impact monitoring:

- Joint decree for DPM and EEZ [4]
- Decree for “Loi sur l’Eau” [5]

A modification of the joint decree DPM and EEZ was asked in order to add more DUs and to update the configuration of the installation following the changes which occurred during the construction (deep-sea location, cable route, configuration of the DUs). A modified decree [6] was released in May 2017 after the successful consultation of the CMF.

The request of installation of a permanent acoustic system was done in December 2016 to the maritime prefectural office for the 2 systems (navigation acoustic positioning system and detector acoustic positioning system) present in the deep-sea infrastructure. There was no objection from the maritime prefecture to install these systems.

3.2 Phase 2

The goal was to request the authorizations to install a full KM3NeT ORCA building block of 115 Detection Units and some additional instrumentation for the ESS, as shown in figure 4, but excluding the ANTARES cable planned to be treated later, following the advice of the DDTM given during a joint meeting. We indeed realized that the installation of the ANTARES cable in 2001 was not performed according to the regulations. It should have followed the same process as the new cable, despite that it was declared to the administration with the deliverance of an “Autorisation d’Occupation Temporaire” (AOT). The present AOT is valid until 31/12/2020.

All equipment to be installed during the phase 2 is located in the EEZ, so only one procedure is needed. We asked the SETEC IN VIVO company that did the procedure for the phase 1 to realize the documentation needed for the EEZ procedure in order to install the KM3NeT/ORCA building block and the foreseen ESS instrumentation. The document contains mainly the description of the installation, the procedure to install it and to realize its maintenance, the environmental impact and the socio-economic impact. The studies concluded that there is no impact or they are negligible. The document was provided to the DTTM on January 2017 and an updated version [7] on April 2017 (1st page in annexe 1) including some precisions requested by the administration.

The presentation of the request to the CMF for an advisory report, mandatory in the procedure, was planned in January 2018 but it was cancelled and postponed to June 2018. The CMF committee approved unanimously the request as there is no impact of the project on the environment.



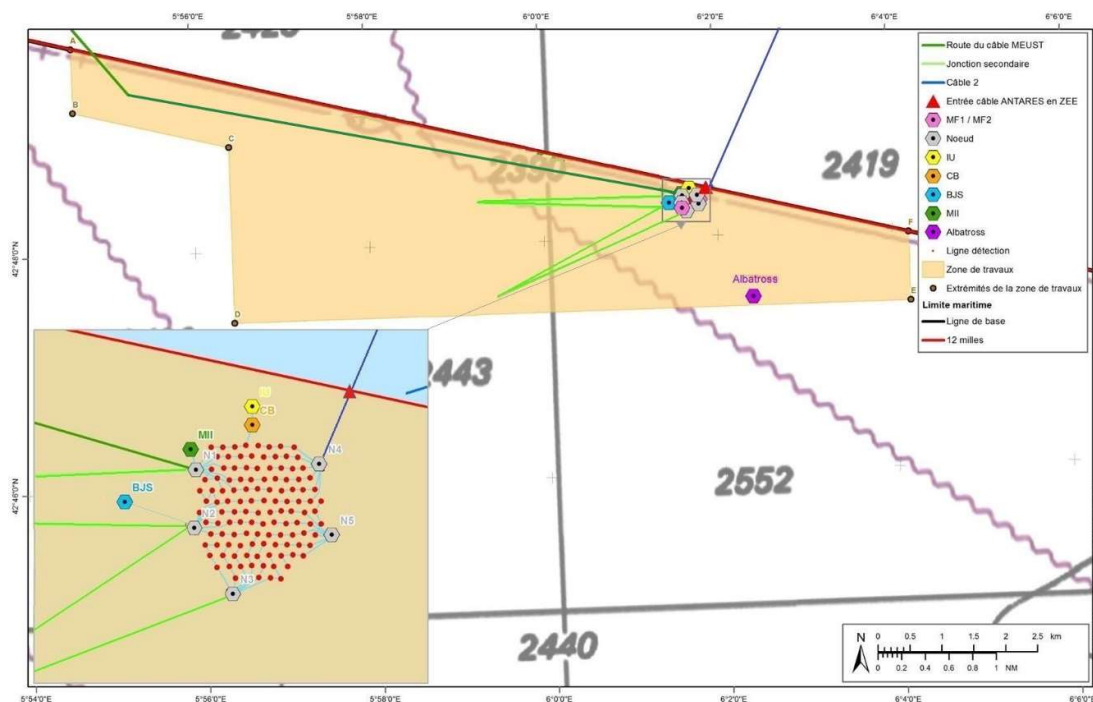


Figure 4: Installation map of the equipment for a full building block

Following a meeting in January 2019 with the DDTM and the Prefecture Maritime, an addendum [8] was released in February 2019 to update the configuration of the infrastructure following its installation, adding some items and including the ANTARES cable. It was finally proposed by the maritime prefectural to regularize the ANTARES cable with the present procedure as it is not expected to change its cable route in the more delicate areas (landing part, posidonia meadow and canyon) but only in the deep-sea part. We will have to ask an extension of the AOT from 1st January 2021. This is expected to be done in September 2020.

The prefectural decree was expected for mid 2019 but in the mean time the administration set a new regulation to implement annual fees for the equipment installed in the EEZ (like for the DPM) which delayed the process. The prefectural decree [9] n° 268/2019 of 24/09/2019 (1st page in annexe 2) is a modified version of the original joint decree. There is no specific request as it was considered that the new installation will not introduce significant modification compared to the initial project. An important point is that no fees will finally be applied for the equipment installed in the EEZ as previously mentioned.

In addition, the Service Hydrographique et Océanographique de la Marine (SHOM) has included in the marine maps, as shown in figure 5, the cable route and an area of scientific instruments that indicates to sailors, fishermen... the presence of the RI.

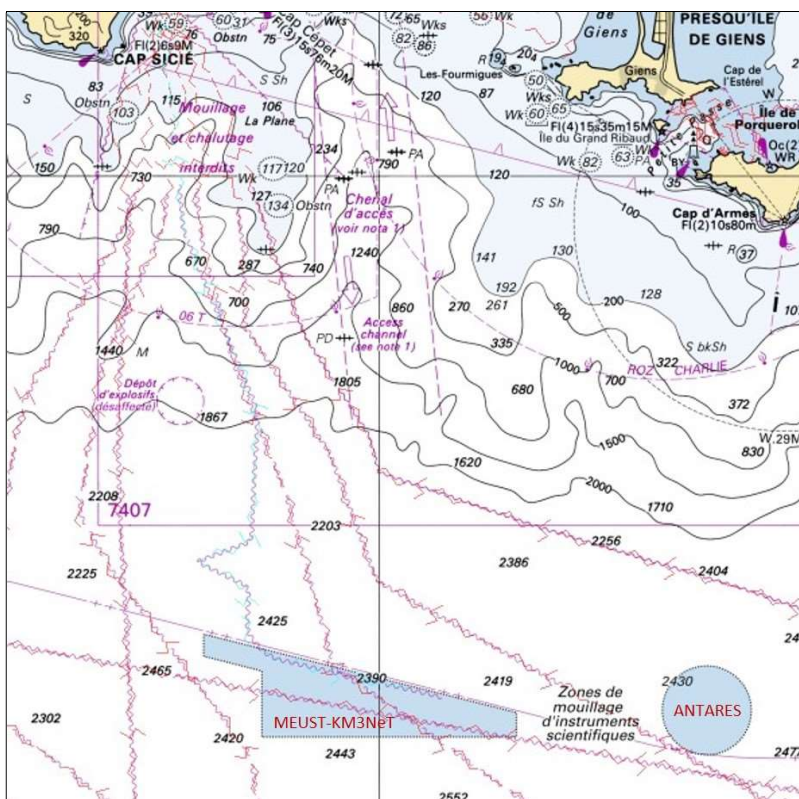


Figure 5: Marine map of the SHOM with areas of the RIs

3.3 Monitoring of the impact on the environment

The prefectural decree asked to monitor the environmental impact on the posidonia meadow 2 years, 5 years and then every 5 years after the cable laying. A survey was done just after the cable installation in 2015 to have the initial state as reference. The inspection after 2 years was performed in 2017. For this purpose, a tender was launched to select a company. It was awarded to SEMANTIC TS. The company is an engineering company in Acoustic Oceanography specialized in underwater acoustics measurements. Since 1993, SEMANTIC TS has been producing various maps and studies: geoacoustics, acoustic, currents, bathymetric, biocenotic). In 2003, SEMANTIC TS acquired its own means of investigating the seabed. It is equipped with acoustic single and multi-beam sounders, side scan sonar, differential GPS centimetric GPS, underwater camera, acquisition system, automatic pilot. It is specialized in the realization of multi-sensor mapping, and in particular the depth of the seabed (bathymetry) and marine biocenoses. Since July 2014, SEMANTIC TS has been providing MINO (Mini Oceanographic Vessel) with multibeam bathymetry from an ultra-light vessel.

The survey was done in June 2017 and the main conclusion of report (1st page in annexe 3) of the survey [10] is: "No recommendation is recommended; the underwater cable is properly attached to the substrate and does not appear to impact the good development of the posidonia meadow". Next year, in 2020, a new inspection is due and will be performed.

4. Results

The study of the environmental impacts shows as expected that the installation has a minor or negligible impact on the environment and on activities in the Toulon area. The different committees that have examined the project along the procedure confirmed this. The authorizations of installation was obtained for the prototype phase and more recently for the KM3NeT/ORCA building block and all foreseen ESS instruments.

These authorizations imposed a regular survey of the impact on environment; the first one was done in 2017 without any issue found.

The regularization of the ANTARES main cable is done for the EEZ with the new prefectural decree and for the DPM we will have to ask an extension of the AOT in 2020.

5. Analysis

The actions went more or less as expected as we experienced the procedure in the prototype phase. During the procedures new regulations for the EEZ were published that introduced some delays and extra costs.

6. Deviations from the plan

The plan was to obtain the authorization to install the KM3NeT/ORCA building block in due time to be in line with the planning of the KM3NeT DU installation and to regularize the ANTARES main cable.

The authorization for the installation of the ORCA building block was delayed due to delay during procedure, mainly due to the CMF meeting postponed by 6 months and later due to the implementation of fees, that finally will not be applied, for the installation in the EEZ. This delay had no impact as the planning of installation of DUs for KM3NeT had also some delays and finally we got the authorizations before we need them.

The ANTARES cable has an authorization (AOT) up to end of 2020 (which could certainly be extended as we previously did), so the delay in the procedure has no impact.

7. Lessons learned

We don't know about the regulations and laws, so if we want to install some infrastructure onshore or offshore we have to ask first the government offices to have some information on what you could expect. Then the complexity of the regulations and laws are difficult to evaluate at our level so we have to ask a specialised company to identify the procedure to follow and write the documentation. We successfully did that for the KM3NeT/ORCA RI.



All this process has a non-negligible impact in term of cost for:

- the realisation of the documentation including survey and sample collection and analysis;
- the procedure itself (public inquiry, publications...);
- the construction to implement some recommendations;
- the operation with some annual fees;
- the regular survey every x years;
- the maintenance if needed.

A budget must be allocated for this.

Moreover, all these procedures require time, about 1 year in the best case, and must be included in the planning of the project with some margin as some committees meet only every 6 or 12 months.

It is mandatory at the start of the project to define carefully the site taken into account all the parameters (we missed some of them) in term of configuration, logistic, access, laws or/and regulations and environment and to evaluate the actions to conduct for the installation.

A survey of regulation in the pipeline is advised to be prepared for a new regulation and avoid problems or delays in the procedure.

8. Next steps

The authorizations for the parts in the territorial waters DPM and EEZ for the equipment installed in the prototype phase and for the phase 2 with a full KM3NeT/ORCA building block have been obtained. In 2020 and then every 5 years, a survey will be made to monitor the impact of the installation on the environment close to the shore.

In 2020 we will have to ask an extension of the AOT for the ANTARES cable.

In addition we have to inform the CMF about the progress and status of the installation.

If another KM3NeT building block or additional ESS instrumentation is foreseen, the necessary procedure will be conducted to update the present authorizations.

9. Conclusion

The procedures were successfully followed and we obtained all the authorizations to install the KM3NeT/ORCA building block and the foreseen ESS instrumentation. This has required some work to provide information and data, and to follow the procedure. The installation of the Research Infrastructure has a minor or negligible impact on the environment. Regular contacts with the administration to understand the situation with regard to the regulation is mandatory as well as the support of an engineering company to release the documentation needed. Specific budget and time should be allocated since the beginning of the project to fulfil this procedure.

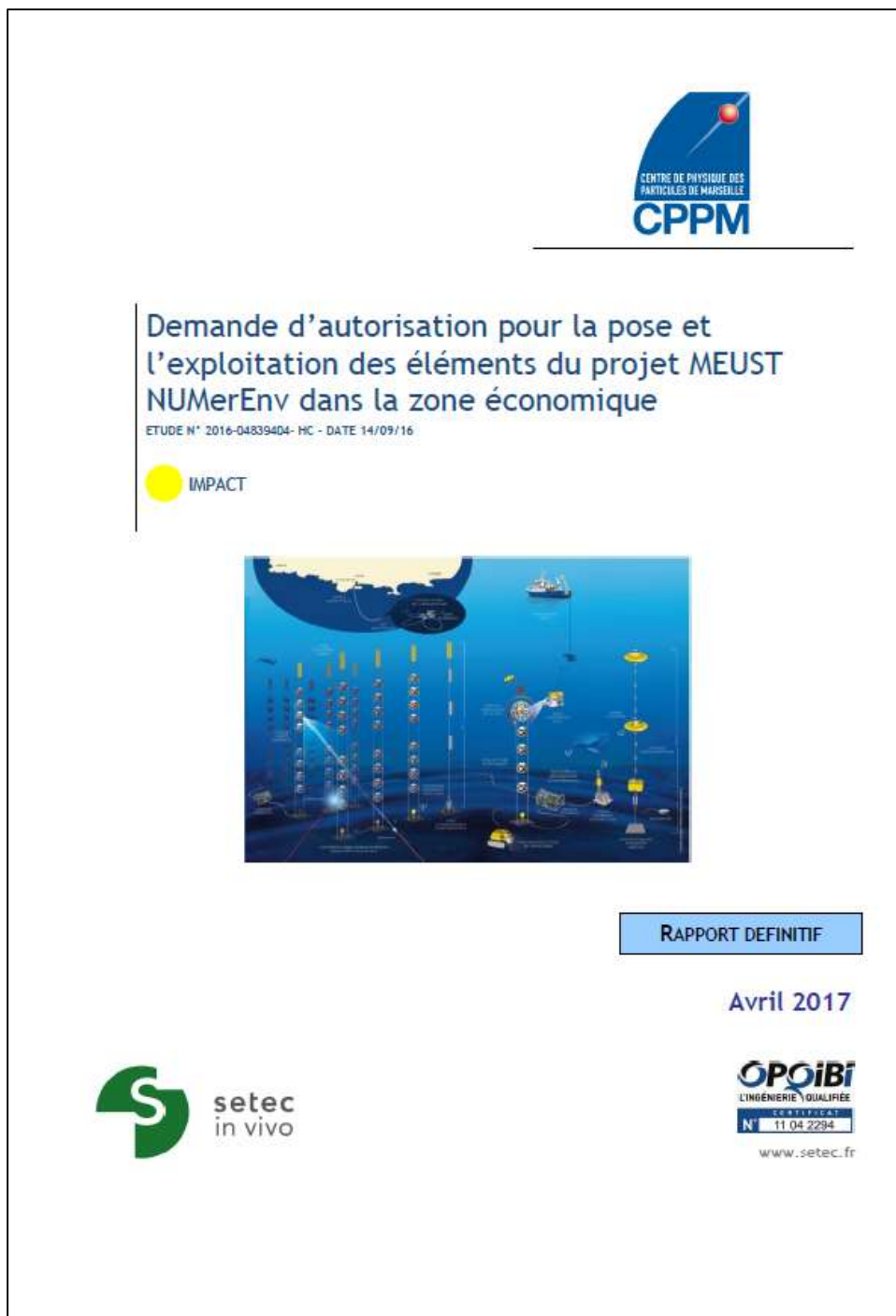


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Annex 1



Annex 2



Liberté - Égalité - Fraternité
RÉPUBLIQUE FRANÇAISE

PREFECTURE DU VAR

N°

DU

**PREFECTURE MARITIME
DE LA MEDITERRANEE**

N° 268 / 2019

DU 24 SEP. 2019

ARRETE CONJOINT
portant modification

de l'autorisation au titre de l'article 10 du décret n°2013-611 du 10 juillet 2013 relatif à la réglementation applicable aux îles artificielles, aux installations, aux ouvrages et à leurs installations connexes sur le plateau continental et dans la zone économique et la zone de protection écologique modifié ainsi qu'au tracé des câbles et pipelines sous-marins, pour l'installation du télescope sous-marin MEUST par le Centre de Physique des Particules de Marseille - Commune de La Seyne-sur-Mer

*Le Préfet du Var,
Officier de la Légion d'Honneur,*

*Le Vice-Amiral d'Escadre,
Préfet maritime de la Méditerranée,
Commandeur de la Légion d'Honneur
Officier de l'Ordre National du Mérite,*

Concernant l'autorisation de construction, d'installation et d'utilisation dans la zone économique.

Vu le décret n°2012-1148 du 12 octobre 2012 portant création d'une zone économique exclusive au large des côtes du territoire de la République en Méditerranée,

Vu le décret n°2013-611 du 10 juillet 2013 modifié relatif à la réglementation applicable aux îles artificielles, aux installations, aux ouvrages et à leurs installations connexes sur le plateau continental et dans la zone économique et la zone de protection écologique ainsi qu'au tracé des câbles et pipelines sous-marins,

Vu l'arrêté conjoint du 2 septembre 2014 du préfet du Var et du préfet maritime de Méditerranée autorisant l'installation du télescope sous-marin MEUST, modifié par arrêté conjoint du 19 mai 2017,

Vu l'absence d'objection signifiée par la préfecture maritime le 16 février 2017 concernant l'installation de dispositifs d'écoute passive en mer tels que décrits dans la demande du Centre de Physique des Particules de Marseille en date du 15 décembre 2016,

Vu la demande et le dossier annexé du 25 avril 2017 déposés par le Centre de Physique des Particules de Marseille concernant la finalisation du télescope sous-marins MEUST à partir de la commune de la Seyne-sur-Mer,

Vu l'information au conseil maritime de façade en date du 28 juin 2018,

1/3

