ESIA NON-TECHNICAL SUMMARY (NTS)

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March 2016

ENERGEAN OIL & GAS

PRINOS OFFSHORE DEVELOPMENT PROJECT

Environmental & Social Impact Assessment (ESIA)

Non Technical Summary (NTS)

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PRINOS OFFSHORE DEVELOPMENT PROJECT ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)	
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1 INTRODUCTION

1.1 OVERVIEW

This Non-Technical Summary provides a summary of the Environmental and Social Impact Assessment (ESIA) undertaken for the purposes of installing planned and potential new offshore hydrocarbon extraction facilities by Energean, and the amendment of the environmental permitting conditions for its existing offshore installations, in the Gulf of Kavala, Greece. The offshore ESIA is complemented with the existing ESIA for the onshore Sigma plant, which has recently been renewed. The onshore ESIA is summarised in a separate summary document. This NTS focusses primarily on the offshore development and existing offshore infrastructure but also includes an overview of the onshore processing facilities.

Prinos development area is located offshore in the Gulf of Kavala, 8 km west of the island of Thasos and 18 km south from the main coastline of Kavala. The Gulf of Kavala is part of the Thracian Sea and falls within the North East Aegean as presented in the below maps. The Project area extends over an approximate area of 4 km^2.

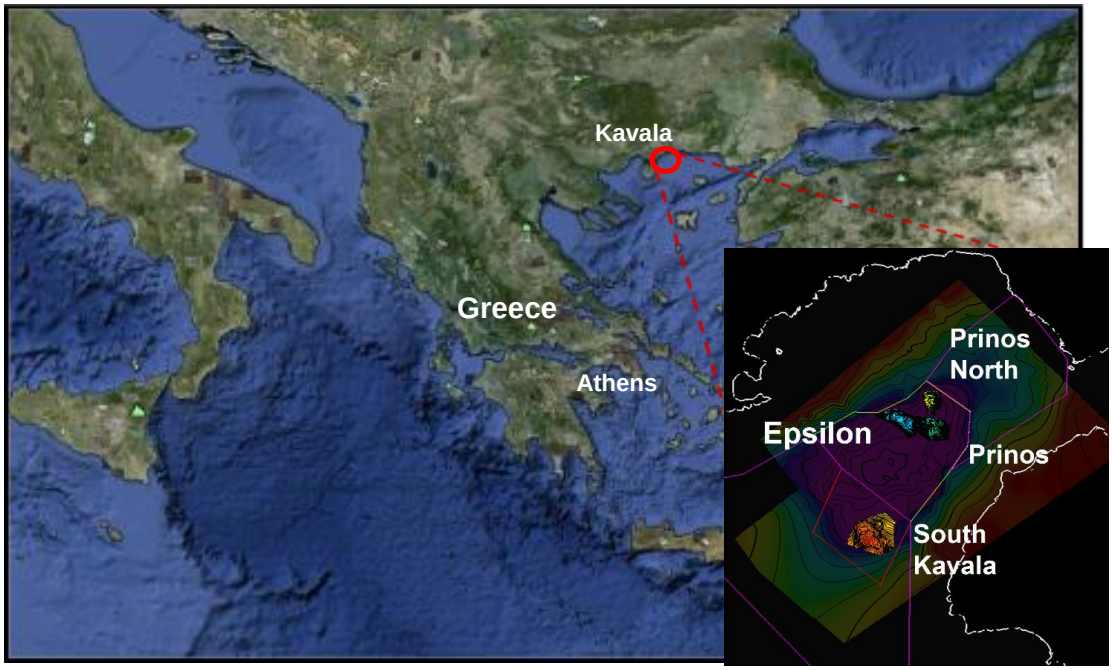


Photo 1: Location of the Project in the Gulf of Kavala and hydrocarbon deposits in the Gulf of Kavala.

1.2 PROJECT BACKGROUND

Current oil and gas production comes from three offshore fields in the Prinos basin (Prinos, Prinos North and South Kavala) in the Gulf of Kavala. Oil and gas are produced offshore via various wells from three small drilling platforms (Alpha, Beta and Kappa). Alpha and Beta are linked by bridges and pipelines to a central processing platform (Delta). Kappa is a remote satellite located 12 km south of the Prinos platforms. Partially processed oil and gas are transported through subsea pipelines from Delta to the onshore Sigma plant where final processing occurs. All gas produced is consumed internally by Energean for steam generation and gas lift purposes. Stabilised and processed crude oil is loaded to tankers through an offshore crude loading facility located near Sigma plant. Produced water generated by the wells is treated and discharged to the sea. Sulphur produced through removing hydrogen sulphide from the crude oil is sold to a local fertilizer plant.

Oil and gas were first discovered in the Prinos basin in the mid 1970's. The current production and processing facilities came into operation in 1981 with minor expansion projects implemented in the 1980's and 1990's. Sweet gas, with small volumes of condensate, is produced from the South Kavala field – now largely depleted – and sour oil and gas are produced from the large Prinos accumulation. Current recovery from the Prinos field is a little less than 40% of the original hydrocarbons in place. South Kavala is 90% depleted. A number of smaller accumulations were discovered during the exploration phase, but only one of these – Prinos North – has been partly developed to date. Energean acquired the Prinos assets in 2007 and has executed a re-development programme whilst appraising the remaining potential of the Prinos field and its immediate satellite fields (Epsilon and Prinos North). As a result of this work, Energean is now planning to increase oil production from the Prinos area through further development of existing fields and the installation of new facilities and wells.

To achieve this, the Company has purchased and refurbished a 2,000 horsepower tender assisted drilling rig (named 'Energean Force'), which has embarked on a 10-well infill-drilling programme from the existing Prinos Alpha platform. This drilling work falls under current permits and approvals already granted by the Greek authorities. This drilling campaign will be completed by the end quarter one, 2017.

In parallel Energean will construct a new drilling platform that will be located in the Epsilon field 3.5 km to the north west of the Prinos platforms. This new platform (Lamda) will be connected to the existing Delta platform by three new pipelines as well as an umbilical cable that will transfer electricity, data and chemicals.

A second identical platform (Omicron) will potentially be installed at a later stage, approximately 2 km to the north of the Prinos platforms. This platform would enable the Prinos North field to be fully developed as well as enable production from the existing Kazaviti (Zeta) discovery. Omicron will be connected to Delta platforms via pipelines and umbilical's much like

Lamda. Lamda and Omicron will also be connected to each other via pipelines.

Both new platforms are designed to be unmanned. No processing will take place on the new facilities. Available processing capacity on Delta platform will be employed. The Project will not require modification of the existing platforms other than attachment of the pipelines from Lamda and Omicron to Delta platform through existing connection points. Similarly the onshore Sigma plant will not require modification and will operate at a lower production level than the design capacity. The Epsilon and Prinos fields will both produce sour (high hydrogen sulphide content) oil and gas with similar properties to that of the current oil and gas produced from the Prinos basin.

Partially processed oil and gas is transported through submarine pipelines to the onshore plant, called Sigma plant. The Sigma plant includes units for converting produced sour gas to sweet gas producing sulfur by a chemical reaction of hydrogen sulphide, for the dehydration, desalination, stabilization and storage of the produced crude oil in order to be safely loaded on tankers.

Due to the fact that the overall project consists of already existing facilities in operation since 1981, planned extension as well as potential further developments the present ESIA, covers:

- The overall offshore facilities that have been developed and in operation since 1981;
- The planned extensions to be included in the EBRD loan package; and
- The potential future extensions that Energean is currently studying.

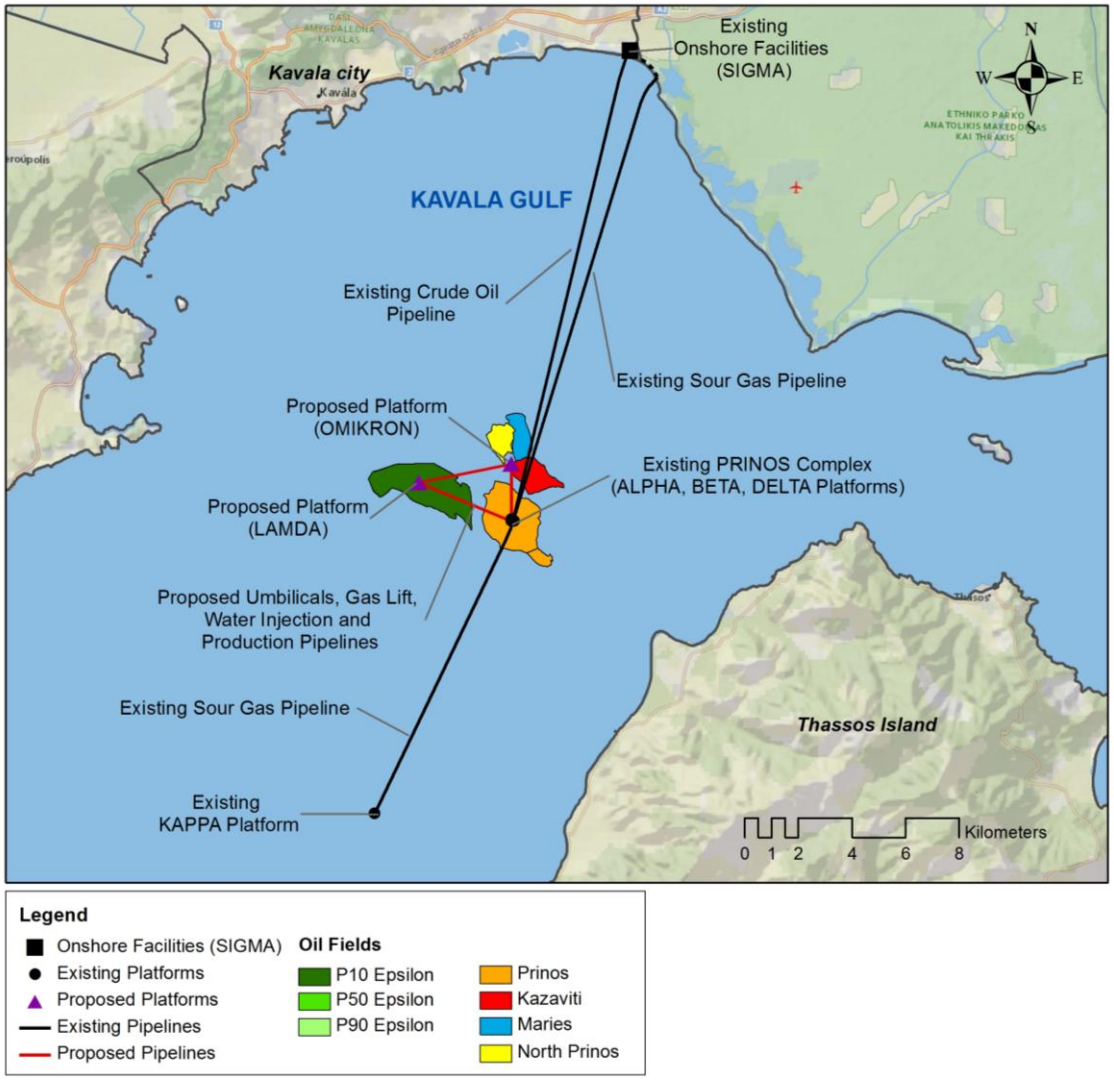


Photo 2: Project area

1.3 LEGAL FRAMEWORK – REQUIREMENTS – PEMRITTING ROADMAP

According to Joint Ministerial Decision 1958/13-01-2012 on the classification of projects and activities, the Project falls into Group 5 “Mining and similar activities”, Serial Number 7 “Pumping of hydrocarbons and exploratory drilling in search of hydrocarbons” and is classified as Subcategory A1 and requires an Environmental Impact Assessment. The environmental permitting procedure for the Project is defined by the Law 4014/2011. The contents and the level of detail of the Environmental Impact Assessment Study are set out in the Joint Ministerial

Decision (JMD) 170225/2014 depending on the Project's classification. This process and the requirements for EIA are aligned with the EU EIA Directive, Following consultation with the Greek authorities, it has been agreed that this ESIA will be prepared so as to also cover the operation of the existing facilities in the Prinos offshore area since the operations of the new and old offshore facilities will be operationally interlinked.

For completeness, the facilities associated with the depleted South Kavala gas field are included, although these are not linked to the planned new facilities; South Kavala facilities are connected to the existing Delta platform in Prinos Complex. Although depleted, gas is produced intermittently and Energean is looking at methods to further increase gas and condensate production whilst the Greek authorities formalize plans for converting this field into a strategic gas storage project. The onshore facilities are covered by a detailed Environmental Impact Assessment, which was renewed and reapproved by the Greek authorities in 2013, (213450/5/12/2013, General Secretariat of Environment, YPEKA – currently YPEN). The existing offshore facilities are also covered by an EIA, which was renewed and reapproved by the Greek authorities in 2013 (46781/12/8/2013).

The European Bank of Reconstruction and Development (EBRD) is currently considering providing financing for the Project and therefore the EIA has taken into consideration the EBRD's environmental and social requirements. These are the EBRD's Performance Requirements (PR) which form part of the EBRD's Environmental and Social Policy of 2014. As per the Policy, the Project is categorised as A and requires a full Environmental and Social Impact Assessment and disclosure thereof for a minimum of 60 days prior to a financing decision. Rather than producing separate ESIA documents, one for permitting and one for financing,

Energean has produced an ESIA that serves both purposes and which is supported by various additional documents, which together form the ESIA disclosure package. Similarly the Project will combine permitting and financing disclosure requirements. The biggest difference between a permitting EIA in the EU and an ESIA to EBRD standards is a more detailed consideration of social issues in addition to environmental issues. Furthermore the EBRD requires engagement with stakeholders as early in the ESIA process as possible.

1.4 THE ESIA PACKAGE OF DOCUMENTS

The ESIA package of documents includes the following:

- Main ESIA report
- This Non-Technical Summary
- Onshore ESIA for Sigma Plant (2013)
- Onshore ESIA Summary (2016)

- Environmental and Social Action Plan (ESAP), which will form part of the loan agreement between the EBRD and Energean
- ESIA Appendices:
    - Permits
    - Maps and drawings
    - Geophysics survey
    - Specific ecological study
    - Study of the benthic communities
    - PAHs final report-Chemical analysis pollution assessment
    - Oil spill modelling
    - Chemical use plan
    - Waste management plan
    - Stakeholder Engagement Plan
    - Chance of finds procedure for cultural heritage
    - Contingency plan
    - HSE plan
    - Traffic management plan
    - Construction management plan
    - Biodiversity wildlife management plan
    - Pollution prevention plan

1.5 STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

Energean has developed a Stakeholder Engagement Plan (SEP) as part of the ESIA which defines how the Company will engage with stakeholders such the public, authorities, community and industry representatives and other organisations during the disclosure of the ESIA and during the life of the Project. It also defines what information will be disclosed to stakeholders and defines how stakeholders can raise any complaints, concerns or questions regarding the Project and the ESIA with the Energean through its grievance mechanism. These engagement and disclosure provisions are supplementary to any authority led activities through the Greek project permitting process.

Early on during the ESIA, the Project engaged with various stakeholders to inform the content of the ESIA and take into account various concerns, questions and opinions. The ESIA is now complete and is disclosed publically for stakeholder review and comment before submission to the relevant environmental authorities for the formal permitting process, which will include additional disclosure activities. This early disclosure of the ESIA is an EBRD requirement which necessitates the disclosure of the ESIA in the public domain for a minimum of 60 days prior to presentation of the Project for a financing decision.

The ESIA is available in both English and Greek (except for specific specialist studies which are to be translated) and available as follows:

Electronically:

- www.energean.com/operations/#development/epsilon
- www.ebrd.com/esia.html

Physical locations:

- Energean's Athens office (17th floor, Atrina Center 32, Kifissias Avenue, 151 25 Marousi, Greece, Tel: + 302108174200)
- Energean's Sigma Plant (Kavala Oil S.A.: Oil Plant, Nea Karvali, 64 006, Kavala, Tel.:+30 2510317201)
- Chamber of Commerce of Kavala: 50 Omonias Street, 653 02, Kavala, Tel.: +30 2510 222212
- Chamber of Commerce of Chrysoupoli: 106 Venizelou, 64 200, Chrysoupoli
- Thasos: 'Makryammos Bungalows' at Limenas, Tel.: +30 25930 22101
- EBRD Resident Office in Athens, 6 Othonos Street, 5th Floor 105 57 Athens, Greece

Energean will launch a series of public meetings where the findings of the ESIA will be presented and company representatives will be available to answer questions about the Project. These will be advertised locally well in advance of meeting dates.

Questions, queries or complaints regarding the Project or the ESIA can be raised directly with

Energean through the Company's grievance mechanism:

- Energean Oil & Gas S.A., 17th floor, Atrina Center, 32 Kifissias Avenue, 151 25 Marousi, Athens, Greece, tel: +30 2108174200, fax: +30 2108174299; contact person Mr. Sotiris Chiotakis / Mrs. Alexandra Goutra.
- Kavala Oil S.A., P.O. Box 8, 64006 Nea Karvali, Kavala, Greece, tel: +30 2510317201, fax: +30 2510317204; contact person Mr. Vassilis Tsetoglou.
- Web site: www.energean.com/contact
- E-mail: complaint@energean.com

2 ALTERNATIVE DEVELOPMENT OPTIONS

The alternative development options addressed by Energean in the Feasibility and Concept stages are discussed and contrasted with the baseline option of not developing the fields at all – the so-called “Do Nothing” option as well as alternative options were assessed against a set of set objectives which are the following:

- Minimize potential impact on the environment;
- Ensure safety risk levels can be brought to ALARP;
- Minimise project risk – focus on simplification of interfaces during installation phase;
- Maximise use of existing facilities, and staff resources;
- Maximise opportunities for Greek companies.

Alternative options were investigated for the planned and potential future development options and were implemented for the following parameters:

- Field development options;
- Drilling options;
- Platform type and installation;
- Topside facilities option and
- Pipelines options

Following analysis of all possible options and assessment against technical, financial and environmental criteria and the aforementioned set of objectives, the most suitable options were selected that best fit the Prinos development needs, safety and environmental requirements.

3 PROJECT DESCRIPTION

The Project covered by the current ESIA is sub-divided into three discrete sub-elements, namely:

- **Existing offshore facilities:** which will remain fundamentally unchanged during the Project. Minor modifications will be applied to the Prinos Delta platform to allow the planned and potential new platforms to be tied into existing process facilities.

  The Prinos Complex is made up of four platforms. Alpha and Beta are production or drilling platforms each containing twelve (12) drilling slots, that can be used for production or injection wells. Delta platform contains all of the processing equipment and the control room. A small jacket bridge linked to Delta contains a remote flare. The Prinos North field is exploited via an Extended Reach Well drilled from Alpha platform. South Kavala is exploited via a production platform identical to Alpha and Beta. This platform contains two (2) wells plus equipment to compress and dry produced gas. South Kavala platform is unmanned and operated remotely from Delta.

  Kappa platform is located in the Gulf of Kavala, above the sweet (no hydrogen sulphide content) natural gas deposit of South Kavala, 12 km to the southeast of the Prinos platforms complex. Currently the Kappa platform is produced intermittently.

  The existing facilities include the following components:

  - ⇨ The Kappa platform located on the sweet, non-associated gas field South Kavala
  - ⇨ The 6” pipeline that transports sweet gas and condensate from South Kavala to Prinos Delta
  - ⇨ The 12-slot production jackets Prinos Alpha and Prinos Beta which form part of the bridge linked Prinos complex
  - ⇨ The Prinos Delta platform that contains all offshore processing facilities and which receives oil, gas, water and condensate produced from Prinos, Prinos North and South Kavala fields. Prinos Delta is bridge linked to Prinos Alpha and Prinos Beta as well as the Prinos flare jacket. New risers will be added to Prinos Delta to allow it to receive fluids from Lamda (and potentially Omicron) and send lift gas and water for injection to Lamda.
  - ⇨ The Prinos flare jacket
  - ⇨ A 12” dry-gas pipeline connecting Prinos Delta to the onshore facilities
  - ⇨ An 8” oil pipeline connecting Prinos Delta to the onshore facilities
  - ⇨ A 5.3” pipeline that transfers sweet dry lift gas from the onshore facilities to Prinos Delta

- Two 10kVA submarine power cables that transport electricity from the onshore facility to Prinos Delta.

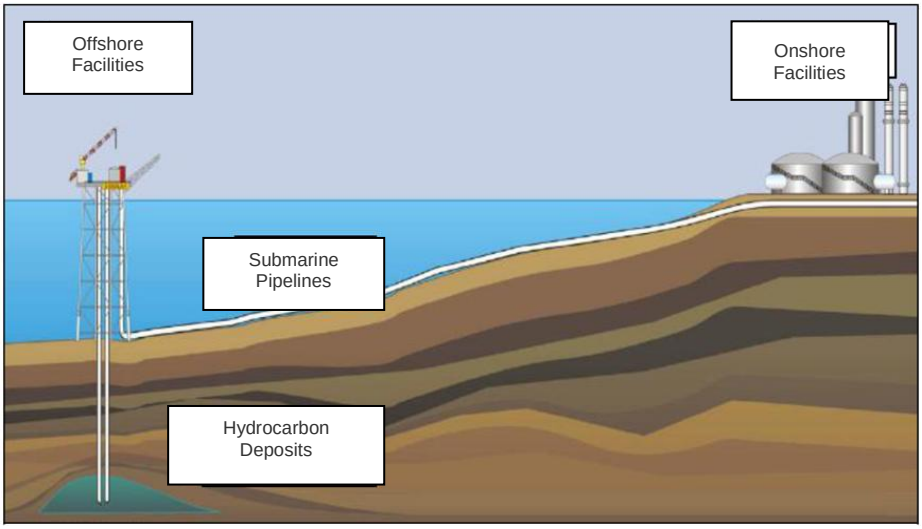


Figure 1: Existing facilities

Photo 3: Platform Alpha with Energean Force

Photo 4: Platform Beta

Photo 5: Platform Delta

Photo 6: Platform Kappa

Photo 7: Onshore facilities Sigma

Photo 8: Onshore facilities Sigma including crude oil storage tanks

Photo 9: Sigma site

- **Planned extension project:** which includes the side-tracking of 10 existing wells located on the Prinos Alpha platform in addition to the installation of a new satellite platform (Lamda) and the drilling from this facility between 5 and 9 new development wells. It is this part of the Project that is subject to potential funding from the EBRD. This includes the following:
  - ⇨ The re-entry of nine (9) existing wells on the Prinos Alpha platform and the sidetracking of these to new bottom-hole locations in the Prinos field. These wells target undrained pools of oil in the A, B and C reservoir units.
  - ⇨ The re-entry of one (1) existing Prinos North extended reach well located on the Prinos Alpha platform, with the objective of side tracking it up dip of the existing bottom hole location to allow attic oil reserves to be drained.
  - ⇨ The design, fabrication, installation, commissioning and subsequent operation of a

new well-head jacket platform (called “Lamda”) approximately 3.5 km’s north west of the existing Prinos platforms. The Lamda platform will host between 5 and 9 wells that will be drilled into and produce from the Epsilon field. This platform has been designed to be normally unmanned. All produced fluids are transported to the Prinos Delta platform where existing equipment is used to separate oil, water and gas

Energean has selected a sub-structure design for its new facilities that differs from the more traditional jacket structures employed in the past. This approach was driven by the joint desire of minimizing expenditure whilst also maximizing opportunities for Greek entities to play a major role in their construction. The selected design is a “Self-Installed Platform 2” (SIP2); a proprietary technology of SPT Offshore. It has been employed previously in the UK and Dutch sectors of the North Sea as well as in West Africa.

The SIP2 design allows for installation without the need for mobilization of a large supporting fleet. Traditional jackets with driven piles, particularly in shallow water can cost as much to install as to build. The organization of external resources such as crane barges, piling spreads etc. also increases interfaces and hence schedule risk. The SIP2 platform is assembled onshore and floated to location on a relatively standard barge readily available in most locations. At site the platform “self-installs” in a matter of a few days, rather than a few weeks which is the norm. The installation itself is relatively weather insensitive, particularly when compared with the conditions required for heavy crane lifts, topside float-overs etc. In principle the SIP2 is equivalent to a jack-up drilling unit, except that it is not equipped with sufficient permanent buoyancy to float, and has more substantial suction anchors (suction piles) to enable it to be designed for permanent installation and does not have permanently installed jacking systems to raise and lower the deck to water level and lift the legs out of the water. Like a jack-up it can be moved from location; making it particularly attractive for fields with a short production life and also facilitating eventual abandonment. Clearly these aspects significantly reduce its environmental footprint, as it is in effect completely recyclable unlike a traditional jacket. Environmental impacts during the construction phase are also significantly reduced compared with a more conventional approach.

Stage 10 F3FA As-installed

Calder Installed

Photo 10: Examples of SIP2 platforms installed

- Topside structures will be of a traditional design. They will be capable of supporting drilling operations executed by the 'Energean Force' rig. Following completion of drilling the facilities will be normally unmanned with only one to two visits planned per month. The facilities have been designed without flare or vents to minimize air emissions. No processing is undertaken on the new facilities with the hydrocarbon stream being transferred multi-phase to Prinos. The facilities contain no power generation facilities, electricity being imported from the national grid. The only routine emissions to the sea will be treated rainwater gathered in the open drain system. The use of flanges and intrusive instrumentation has been minimized to avoid leak paths and hence the risk of loss of containment. All pipework has been designed for the maximum closed in pressure of the reservoirs thus avoiding the need for relief systems. In this manner Energean has made the facilities as safe and as environmentally benign as possible
- Three (3) sub-marine pipelines that connect Lamda to Prinos Delta. These comprise one 10" pipeline to carry multi-phase well fluids from Lamda to Delta, and two 6" pipelines to carry injection water and lift gas respectively from Prinos Delta to Epsilon
- Between 5 and 9 new wells to be drilled from the Lamda platform into the Epsilon field. These wells will initially be completed as producers with between 2 to 4 being converted after approximately 18 months to water injectors. The range of well numbers planned reflects the uncertainty in recoverable reserves. The designed platform is equipped with 15 slots.

Energean Oil and Gas S.A. commenced this project in late 2014 when it purchased and renovated the Energean Force drilling rig that will be used to undertake all sidetracks and new wells. Sidetracks commenced in September 2015. Currently (early February 2016) the Company is approximately 50% complete with the second of the planned nine (9) Prinos Alpha side tracks.

- **Potential further development project:** which would install a second new satellite platform to allow further development of the Prinos North and Kazaviti fields. This project has yet to be justified and is not associated with the potential EBRD funding.

  Justification would need to have as a prerequisite the successful completion of the planned extension project defined above. This plan would entail the introduction of a second new wellhead jacket (identical to Lamda). This platform ('Omicron') would be located between the Prinos North and Prinos reservoirs and used to further develop Prinos North in addition to the Kazaviti discovery. Kazaviti will be appraised by the 3rd planned Prinos Alpha sidetrack (well PA-36), allowing a decision to be made on the viability of this potential project subsequently.

  Also in this additional project would be a campaign to sidetrack up to 5 of the current Prinos Beta wells to new bottom hole locations.

The onshore facilities (Sigma) are not impacted by the Project or its sub-elements and it is not included in the scope of the offshore EISA.

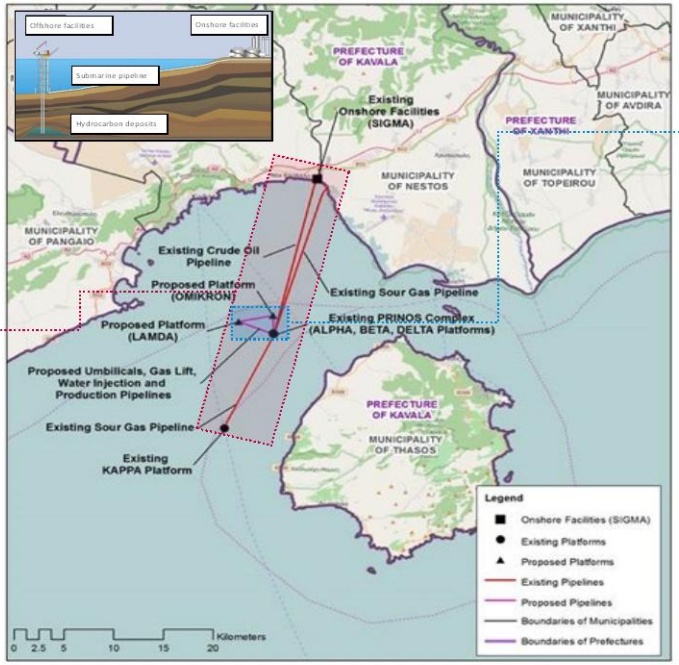
The facilities have a design capacity of 27,000 barrels or bbls/day production of stabilised crude oil. Current production from existing facilities (Prinos, South Kavala fields) reached about 3,000 bbls/day. Following the planned production through Prinos alpha sidetracks this is expected to reach 10,000 bbls/day. The planned development of Epsilon field is expected to raise production to 14,000 bbls/day whereas further future development could reach a peak production of 20,000 bbls/day.

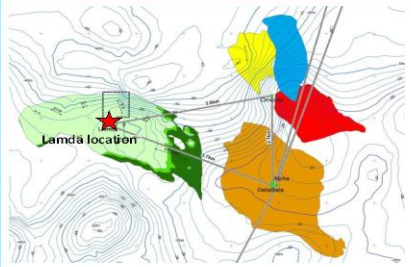
The above information is also presented summarised in the following illustrative infograph for better comprehension of the existing and planned facilities. The below infograph entails also the overall investment plan and its time schedule as envisaged by Energean.

Project Description

EXISTING FACILITIES

- The Kappa platform located on the sweet, non-associated gas field South Kavala;
- The 12" pipeline that transports sweet gas and condensate from South Kavala to Prinos Delta;
- The 12-slot production jackets Prinos Alpha and Prinos Beta which form part of the bridge linked Prinos complex;
- The Prinos Delta platform that contains alhoffs ore processing facilities and which receives oil, gas, water and condensate produced from Prinos, Prinos North and South Kavala fields;
- The Prinos flare jacket;
- A 12" dry-gas pipeline connecting Prinos Delta to the onshore facilities;
- An 8" oil pipeline connecting Prinos Delta to the onshore facilities;
- A 5.3" pipeline that transfers seet dry gift as from the onshore facilities to Prinos Delta;
- Two 10kVa submarine power cables that transport electricity from the onshore facility to Prinos Delta.





PLANNED EXTENSION PROJECT

- The re-entry of nine (9) existing wells on the Prinos Alpha platform and the sidetracking of these to new bottom-hole locations in the Prinos field.
- The re-entry of one (1) existing Prinos North extended reach well located on the Prinos Alpha platform.
- The design, fabrication, installation, commissioning and subsequent operation of a new well-head jacket platform (called "Lamda") approximately 3.5 km's north west of the existing Prinos platforms. All produced fluids are transported to the Prinos Delta platform where existing equipment is used to separate oil, water and gas.
- Three (3) sub-marine pipelines that connect Lamda to Prinos Delta. These comprise one 10" pipeline to carry multi-phase well fluids from Lamda to Delta, and two 6" pipelines to carry injection water and lift gas respectively from Prinos Delta to Epsilon.
- Between 5 and 9 new wells to be drilled from the Lamda platform into the Epsilon field. These wells will initially be completed as producers with between 2 to 4 being converted after approximately 18 months to water injectors. The range of well numbers planned reflects the uncertainty in recoverable reserves. The designed platform is equipped with 15 slots.

POTENTIAL FUTURE DEVELOPMENTS

This would introduce a second new wellhead jacket ('Omicron'), which would be located between the Prinos North and Prinos platforms and used to further develop Prinos North in addition to the Kazaviti discovery. Kazaviti ill be appraised by the 3rd planned Prinos Alpha sidetrack (well PA-36), allowing a decision to be made on the viability of this potential project subsequently.

PRINOS AREA OVERALL DEVELOPMENT SCHEDULE

Development Phases		2014	2015	2016	2017	2018	2019
Planned extension project	Prinos A infill	Energean Force refurbishment	Drill 10 Prinos A infill wells				
	Lamda development	Concept	FEED	Detail	Construct	Drill 7 wells	
Potential further developments	Prinos B infill					Drill 4 wells	
	Omicron development					Construct	Drill 6 wells

ENERGEAN OIL & GAS	Project: **Prinos Offshore Development Project**	Size: A3	Date: Feb 2016	

4 CURRENT STATE OF THE ENVIRONMENT

An overview of the physical and manmade environment of the project area is presented below. A more illustrative view of this is also provided in the info graph at the end of the chapter.

4.1 PHYSICAL ENVIRONMENT

4.1.1 Physical Environment

The prevailing winds through the year are in a north-easterly direction and the relative wind speeds are seasonal. In the winter months (October through to April) the average wind speeds range from 3.8m/s to 5.4m/s occurring 60%-70% of the time characterised as 'gentle breezes'. In the summer months (May through to September) the average wind speeds range from 3.8m/s to 4.1m/s occurring 50-60% of the time, which are characterized as 'light breezes'. Based on prediction modelling results, the significant wave height at the LAMDA platform is less than 1m. The highest waves (6.7 m) during the year are from the south despite the predominant wind direction being the north-easterly direction. It is noted that Thasos Island provides shelter from the southerly waves, to a greater extent for the existing platform, and this is reflected in the higher wave heights reported for the new platform location. The tidal ranges at the study site are relatively small.

According to the Geophysical and Geotechnical survey, the bathymetry of the Epsilon/Lamda platform area is characterized by a plateau at the western part, as described above, with water depth ranging from 37 to 41m and a channel (deeper part) at the eastern and northern part of the area. The slope between these two morphological units is low to medium at the southern part and medium at the northern part. The sediment profiles are consistent with very little sub layering up to depths of 30m and the material is silty sand with presence of biogenic fragments. With regards to the sediment quality and based on the surveys "Trace Metal determination and pollution assessment" and "Polycyclic Aromatic Hydrocarbons", the study area shows minor metal (Fe, As, Pb, Cr, Cu, Mn, Ni, Co, Zn) enrichment except cadmium (Cd). Despite this observed anomaly, the quality of the sediments is below baseline metal pollution with the exception of two sites which show increasing pollution levels The conclusion is drawn based on the average earth crust as reference environment and is considered to be representative of the present situation. The results of the determination of the main PAHs in sediments indicate the non-existence of pollution problems concerning this type of pollutant as the concentrations are below the EU thresholds for Good Environmental Status of marine

environment.

With regards to the seawater quality and based on the aforementioned two surveys, all metal and PAHs values were below detection or quantification limit and below the EU thresholds for Good Environmental Status of marine environment. According to the results of the "Monitoring Program of bathing water quality on the coast Greece in accordance to the specification set out in the Directive 2006/7/EC", the quality of bathing waters in the nearest to the project coastal areas for 2014 is characterized "high" and "good".

Regarding to the air quality, According to the recent annual report 2014 of the onshore and offshore facilities of Energean for 2014, the measurements of the sulphur dioxide (SO_2) and hydrogen sulphide (H_2S) analysers of the Environmental Stations and the results from the 12 air sulfation monitoring stations in the surrounding of area of Kavala and Thasos were all within the permissible limits. The GHG emissions of the offshore facilities during 2014 were 1,684 tn CO_2. With regards to the noise environment, a limitation of 65db is enforced at the border of the facility.

4.1.2 Biotic Environment

Regarding to the plankton and according to the available desk based information, the Aegean Sea, like the rest of the eastern Mediterranean Sea, is an area of low nutrient concentration, plankton biomass and production. The main zooplanktophagus fish in the area is the European anchovy (*Engraulis encrasicolus*) and the main zooplankton groups are Holoplankton (Chaetognaths, Cladocerans, Appendicularians, Copepods, Doliolids, Euphausiids, Medusae, Ostracods, Pteropods, Siphonophores) and Meroplankton (Gastropod larvae, Lamellibranchia larvae).

With regards to the benthic communities and based on the results of the study "Benthic communities in Prinos area", the benthic communities in the study area are typical of the Mediterranean in the given depths and similar to those described for the area in the past. Moreover, there is an increased number of species and individuals in the area of the installations, which is due to the exclusion of the area of other activities and the resulting protection of the sea bottom. With regards to the marine habitats and according to the field survey of marine ecology, the habitat in the area of proposed and new platforms can be characterized as "Mediterranean communities of muddy detritic bottoms" in accordance to the EUNIS Habitat classification. This habitat type is not characterized as "priority" habitat and is not included in the Annex I of the Habitats Directive 92/43/EEC. Annex I contains the types of habitats whose conservation requires the designation of special areas of conservation and some of them are defined as "priority" habitats (in danger of disappearing). Fish species are typical to the Thracian sea and are not under any protection status.

With regards to the marine mammals and based on the results of the seismic survey, the species recorded in the project area are Sperm whale, Common bottlenose dolphin, Striped dolphin and Short-beaked common dolphin. Other species likely to be found in the project area

according to desk based information are Fin whale, Cuvier's beaked whale, Risso's dolphin, Harbour porpoise and Mediterranean Monk Seal.

The project area is included in the network of Important Bird Areas (IBAs) identified by the Birdlife International i.e. specifically, the study area is part of the IBA GR 250 "Gulf of Kavala and marine area of Thasos Island". According to the report “Important Areas for Seabirds in Greece, LIFE07 NAT/GR/000285 – Hellenic Ornithological Society (HOS / Birdlife Greece, 2012), this IBA has been designated for its importance for the Mediterranean Shag (Phalacrocorax aristotelis desmarestii) and for the Yelkouan Shearwater (Puffinus yelkouan) which are included in the Annex I of the Directive 2009/147/EC. The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. The importance of the area is further supported by the existence of Natura areas, Ramsar site and National Park in the coastal areas of the Kavala Gulf.

4.1.3 Manmade and Socioeconomic Environment

The primary sector constitutes the main production activity of the RU of Kavala, both in terms of production contribution to the GDP of the REMTH and in terms of the number of persons occupied therein. Agriculture, animal farming, fishing, aquaculture (in sea and fresh water) and beekeeping are developing throughout the area and contribute significantly to its financial figures. Furthermore, tourism (hotels and restaurants) in Kavala and Thasos Island, as part of tertiary sector, contributes significantly to local GDP and employment. It is also noted that the local community of Kavala has received substantial economic benefits over the last seven years through exploitation of the Prinos deposits by Energean and not least the preceding 28 years of oil and gas extraction in the RU of Kavala prior to Energean’s involvement. Over the last seven years Energean has contributed over 40 mil. Euros in Greek government, through the payment of taxes, royalties and VAT, and through the contributions to employee Social Security Funds (healthcare, pension, etc). A percentage of these contributions are retroceded to the Regional Unit (RU) of Kavala. The Company has also contributed more than 90 million euros to the local economy in Kavala through salary payments to staff members; employment of local contractors; procurement of goods through local suppliers; and use of local hotel, conferencing and restaurant facilities.

With regards to the fishing, Kavala Gulf is considered a fishing ground, especially for species such as European anchovy and sardine. One of the largest fish markets of the Mediterranean operates in the city of Kavala, where goods are traded for domestic and international markets. People, directly or indirectly, connected to the fisheries sector are estimated at 2,000 - 2,500. The catch of the Kavala fleet end up in the Kavala Fish Market in order to be auctioned. There, approximately 8,000 to 10,000 tn of fisheries are traded annually, the larger part thereof comprising small pelagic fishes (sardine and European anchovy). Moreover, various aquacultures operate in the Kavala Gulf.

The density of marine traffic in the Kavala Gulf is high and the number of distinct vessels on a daily basis and count position per square km is more than 140. Safety zones of 500 m surrounding the existing platforms where no unauthorised vessels are permitted are designated, whereas for the existing pipelines a safety zone 200 m is also designated on each side where no anchoring and no trawling is permitted. Kavala Port Authority is the competent Authority for organizing, ensuring, and monitoring the safe navigation terms in the area of the facilities.

With regards to any archaeological findings, the marine area of the Gulf of Kavala is well investigated and there are no signs of archaeological findings that could be of any interests. The shallow waters as well the type of the seabed do not enable the preservation of any possible ruins, through the ages.

Socioeconomic Baseline

The current socioeconomic conditions in the Project area set the benchmark against which impacts are considered. The data presented in this figure was collected mainly from secondary sources (literature, past studies etc) which have been supported by a number of field studies. The primary study area for the socioeconomic baseline comprises the Msettlements along the coast of the Kavala Gulf as well as the Kavala Gulf .

LANDSCAPE AND VISUAL CHARACTER

The area between the rivermouth of Strymonas and Nea Peramos (western shores of Kavala), over the last decade have seen a significant increase of construction activities with regard to holiday houses. The next coastal area between Nea Peramos and Kavala, has long been a tourist attraction, demonstrated by the development of a tourism activities zone, with hotels, holiday and permanent residences, as well as restaurants. The shores of the area between Kavala and Nea Karvali consist of a series of bays with sand beaches, which are formed from low hills, with steep slopes towards the sea.

There are no signs of archaeological findings within the marine area of the Gulf of Kavala. Whereas the shallow waters do not lend themselves to the preservation of any significant archaeological resources.

SOCIO-ECONOMIC ENVIRONMENT

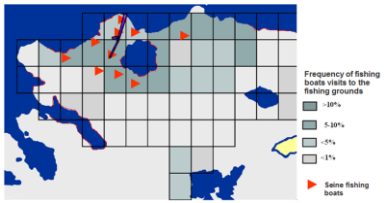
Kavala city is the most developed urban centre of Eastern Macedonia and Thrace, is located exactly on tip of the road axis between Thessaloniki and the Turkish border. It contained the second largest commercial port of Egnatia Odos, to the east of the city of Kavala. With one large port and one equally large marina downtown, in combination with the Nea Peramos port and the Nea Irakleitsa marina, Kavala, among others, is one of the most significant fisheries centres in Greece

As a commercial and industrial centre, it is ranked second in N. Greece, behind Thessaloniki. In addition to tobacco processing industries and tobacco warehouses, food and salted foodstuff factories, as well as roller mills and rice mills operate in the city, while the tobacco of Macedonia and Thrace is exported from its port.

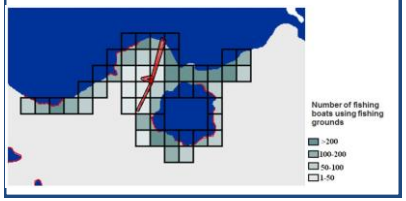
FISHERIES

The entirety of the Kavala Gulf is considered a fishing ground. Targeted species include molluscs (mussels, oysters), crustaceans (shrimps, prawns, crabs) and pelagic fishes (sardine, European anchovy, bluefish, bonito, tuna). A recent survey observed approximately 250 vessels small coastal vessels (3-15 m) and 38 medium sized vessels (15-30 m). An estimated 2,000 to 2,500 people are directly or indirectly employed in the fisheries sector. The principal market is the Kavala Fish Market where approximately 8,000 to 10,000 tonnes of fish are traded annually.

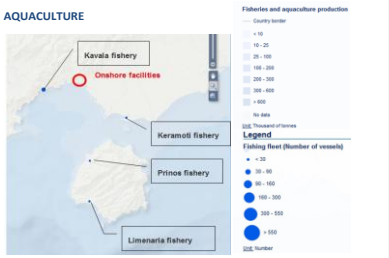
Trawler fishing grounds—red arrows indicate main fish-



Coastal fishing grounds

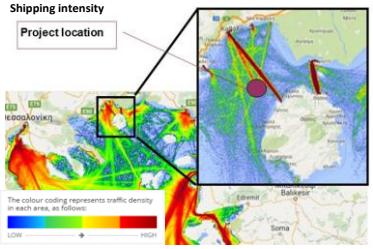


AQUACULTURE



NAVIGATION

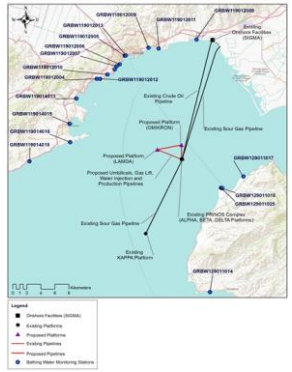
Shipping intensity



TOURISM

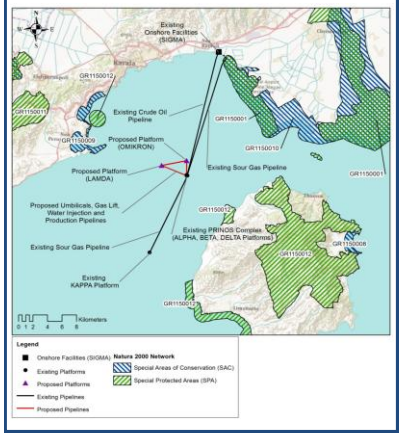
In accordance with data from Hellenic Statistical Authority (ELSTAT, 2011), the RU of Kavala – which includes the island of Thasos, shows greater specialization in tourism, absorbing 54% of all tourists staying in the region. The island Thasos is the main tourist attraction, located in the Kavala Gulf, at the northern part of Aegean Sea. Thasos is one of the most typical cases of coastal areas with mass tourism – and for many decades it is the most known tourist attraction, resulting in large concentrations thereof, either in the form of visitors or the form of holiday-makers.

Main beaches in the Study Area



PORT INFRAESTRUCTURE

PROTECTED AND SENSITIVE AREAS



ENERGEAN OIL & GAS	Project: **Prinos Offshore Development Project**	Size: A3	Date: Feb 2016		Photo credits: Wikipedia, BirdLife, ACCROBANS, Wild Wonders of Europe

5 EMERGENCIES AND RISKS TO THE ENVIRONMENT AND PEOPLE – QUANTITATIVE RISK ASSESSMENT (QRA)

As part of the ESIA a Quantitative Risk Assessment (QRA) study was performed in order to determine the level of risk (to groups of individuals) associated with the existing and proposed new facilities.

Whilst the current QRA work was undertaken to demonstrate that individual and total facility risk levels have been managed to ALARP as part of Energean's work to prepare a Safety Case for the new and existing facilities (in line with European and Greek legislation) it has also been employed to define a number of oil spill scenarios that have subsequently been modelled deterministically to assess potential environmental impacts.

The purpose of the QRA is to provide a numerical estimate of the level of risk to people, associated with identified and defined Major Accidents. Risk is normally presented as IRPA (Individual Risk Per Annum – the chance each worker has of suffering a fatal accident per year of work) and PLL (Potential Loss of Life: the number of staff that might be killed in a defined period). QRA provides a means to compare the derived risk levels against industry accepted tolerability criteria and also provides a baseline against which potential risk reduction measures can be assessed. For new facilities potential design modifications can be implemented to allow risk levels to be reduced to a level that is demonstrated to be ALARP. For facilities already in operation (such as the Prinos complex which this ESIA also covers), it is clearly more difficult to implement design changes. However risk levels can be reduced, principally by introducing enhancements to the way the facility is operated and/or the response measures to prevent failures from escalating.

The QRA is focused on deriving an estimate of the numerical level of risk associated with the major accidents. According to article 2 of EU Directive 2013/30 on the Safety of Offshore Oil and Gas Operations (currently being transposed into Member State legislation), Major Accidents are defined as:

a. *an incident involving an explosion, fire, loss of well control, or release of oil, gas or dangerous substances involving, or with a significant potential to cause, fatalities or serious personal injury;*

b. *an incident leading to serious damage to the installation or connected infrastructure involving, or with a significant potential to cause, fatalities or serious personal injury;*

c. *any other incident leading to fatalities or serious injury to five or more persons who are on*

the offshore installation where the source of danger occurs or who are engaged in an offshore oil and gas operation in connection with the installation or connected infrastructure; or

d. *any major environmental incident resulting from incidents referred to in points (a), (b) and (c).*

e. *for the purposes of determining whether an incident constitutes a major accident under points (a), (b) or (d), an installation that is normally unattended shall be considered attended.*

The Major Accidents for the Prinos QRA were derived based on a review of existing Hazard Identification (HAZID) and risk assessment studies and by review of the processes and activities. The Major Accidents associated with the new SIP facilities are based upon the safety studies performed during the engineering phase.

The Major Accident scenarios considered for the Prinos and Lamda/Omicron QRA can be broadly summarised as follows:

- Release of well fluids, from the wells, during drilling, workover/intervention, production activities. Sources include Alpha, Beta, Lamda, and Omicron platforms. These have the potential to result in fire/explosion/toxic gas effects and/or environmental impact due to oil spillage.
- Release of well fluids, sour gas, sour liquid or sweet gas from the production, export and gas lift subsea pipeline infrastructure. Such releases could result in fire/toxic gas/explosion effects (depending on the location of the release and proximity to platforms). Pipelines containing liquid hydrocarbons have the potential to result in environmental impact.
- Structural failure/collapse, which in addition to the immediate injury/fatality effects, could also result in loss of hydrocarbon containment and hence environmental impacts.
- Ship collision. Impact from attendant or passing vessels have potential to cause immediate injury/fatality effects and also result in loss of hydrocarbon containment
- Loss of control during crew boat operations. A major loss of control (e.g. capsize could result in injury/fatalities. It is noted that personnel logistics activities are conducted by a crew boat, helicopters are not used to support the offshore operations.

It is noted that the Individual Risk Per Annum (IRPA), for the existing facilities resides within the “Tolerable if ALARP” region of the risk management framework.

In addition to the potential impacts on personnel, which as explained above, are the primary focus of the QRA, the major accidents can also affect the environment via the release of quantities of liquid hydrocarbons to sea. The QRA process served to inform a range of credible oil spill cases for which trajectory modelling and impact assessment has been performed.

Oil spill modelling has investigated the potential consequences of significant oil spills associated with:

- A blow out from one of the new wells being drilled on Lamda platform;
- A leak while loading processed crude to an oil tanker.
- A large diameter hole in the main export line that takes crude from Delta to Sigma

The location and size of this latter spill has been determined from an analysis of Major Hazards. The worst case scenario is seen to be damage from a fishing trawler at the point just before the pipeline is buried. This point is at a distance of 7 km from Delta. Beyond this point the oil line is buried and hence safeguarded from external impacts that could lead to a large spill. Corrosion related damage in the buried section would result in small leaks that would be detected immediately during routine inspection activities. As the Gulf of Kavala is flat calm for about 40% of the time (summer and winter) detecting minor sheens is very easy and rapid. Shallow depths allow repairs to be affected with routine diving operations that are on call 24 hrs per day.

The Gulf of Kavala benefits from benign weather conditions that largely mitigate the consequences of significant oil spills. Wind speeds are below a “light breeze” for 35% of the time in December and 49% of the time in June. Hence for most of the year a leak, as modelled, moves very slowly. Strong winds (above “strong breeze”) occur for only 1.25% of the time. All such periods are in the winter months. Average wind speeds in directions that could carry oil to shore are between 2.1 and 4.0 m/s in the winter and 2.4 and 3.4 m/s in the summer. These light onshore winds blow for around 25% of the time. Stronger offshore winds (5 to 7.5 m/s on average) dominate for the rest of the period. Winds to the nearest land fall (the tourist beaches on the islands of Thasos) blow for less than 7% of the time and average 2.2 m/s year round. Energean holds oil spill response equipment, which can be mobilised to site in 3 hours maximum due to the near shore location. The calm conditions and low winds make booming and skimming activities very effective.

To keep the number of scenarios to a manageable level the areas of particular sensitivity need to be identified and scenarios that look at how these areas could be impacted defined. In this framework the following locations have been defined:

- The coast between Nea Peramos and Nea Karvali – this coastline contains the historic port of Kavala, a number of tourist beaches (to the west and east of Kavala), the commercial port at Fillipos, small industrial based marine facilities (Fertiliser plant, Sigma water intake and loading buoys, Refined product intake buoys).
- The coast between the Sigma plant and the mouth of the delta of the Nestos river – this coast falls under numerous protection provisions (part of Natura 2000, SPA, National park, Ramsar wetlands, IBA). Moreover, it holds a number of small-scale fish farming enterprises. The impact on this coastline would be most significant from the late spring through to the end of summer.
- The north and North West coast of the island of Thasos - Thasos is a major tourist destination. Whilst many of the main beaches are on the east and south of the island there are a number of popular tourist locations on the coast immediately adjacent to Energean’s offshore facilities (Rachoni, Prinos, Kalarachi etc.).

A deterministic analysis of the potential impacts of worst-case oil spills from the existing and future offshore oil facilities operated by Energean in the Gulf of Kavala has been undertaken. These scenarios modelled a spill of 475 m^3 over a 24 hour period originating from a well blow-out on the planned new Lamda platform, a spill of 410 m^3 over an 8.5 hour period originating due to the impact of a trawling board striking and rupturing the main export line at the point just before the line becomes buried and a spill of 64 m^3 over a 2 minute period due to a failure of the hose connection to a tanker being loaded with crude at the tanker loading point. The above analyses are presented graphically in the Figures 2, 3 and 4 further below. The model outputs graphically present the pathway of the spills over time, i.e. their dispersion in the first 3 hrs, their end points and time to hit the coast (assuming that no contingency – response is applied to kill the spills and finally the tine required for the spill to deteriorate.

The worst case scenario is a result of a winter storm bringing oil to the shore between the Sigma plant and the port of Kavala following a major rupture of the main oil export line. Under such circumstances oil would arrive at the coast about 7 hours after release and continue for a further 23 hours. Weather from the south produces significant waves. These would prevent the immediate deployment of Energean's oil spill response vessel. Before it could be at site first oil would have reached the coast. As a result of the high waves the leaked oil is emulsified. The volume of emulsified oil arriving at the coast is almost three times the volume of oil spilled.

Whilst such a scenario would have a significant impact to the commercial and tourist activities of the area the chance of such an event occurring is remote. Assuming that oil spill response vessels are not mobilised at all the calculated probability of such a severe event is calculated as 2×10^{-6} (i.e. twice per million years). In the 20 year life spam of the described project the probability would be 4×10^{-5}. In reality the volume of oil would never reach the level calculated. Although the oil spill response system could not prevent some oil reaching the shore it should be in place 4 hours after the beaching commences. Hence if oil arrives at a uniform rate around 83% of the spilled volume should be recovered. It is also highly unlikely that southerly winds would blow continuously for 30 hours. On average southerly winds occur for about 10% of the time on average, with the worst month being April (20%). Thus 40% of southerly winds would have to blow in one continuous period for all oil to be beached. In reality during this period either calm weather or winds from the northeast would occur.

In all other cases there is sufficient time to allow oil spill response vessels to be mobilised. The Kavala Gulf is characterised by low waves heights (for 95% of the time wave heights are less than 1m) and hence skimming operations are very effective. Taking into account the availability of this system the chance of oil arriving on the other two sensitive coasts examined is an order of magnitude lower.

It is therefore concluded that the prolongation of oil production from the existing and planned oil infrastructure does not present significant risk with regards to unplanned/failure events.

As discussed above there is a relatively low chance of oil spilt to the sea from Energean's facilities reaching the coastline of the Kavala Gulf. The location that has the highest likelihood of seeing spilled oil is Ierissos Bay on the Akti peninsula. Predominant winds would likely carry

most slicks formed towards this coastline, unless the spill occurred during heavy southerly winds that blow for limited duration in the Winter months.

The likelihood (probabilities) calculated assumes that:

- A leak actually occurs and
- No response measures are taken to remove the pool of oil before it reaches the shore.

In reality Energean has developed structured controls that create “barriers” to both prevent incidents such as these from occurring and if such incidents do occur, preventing them from escalating to a point where significant damage occurs. Clearly oil spills need to be avoided, but if they do occur, their consequence is relatively limited if the spilt oil is contained offshore and recovered prior to drifting to coast.

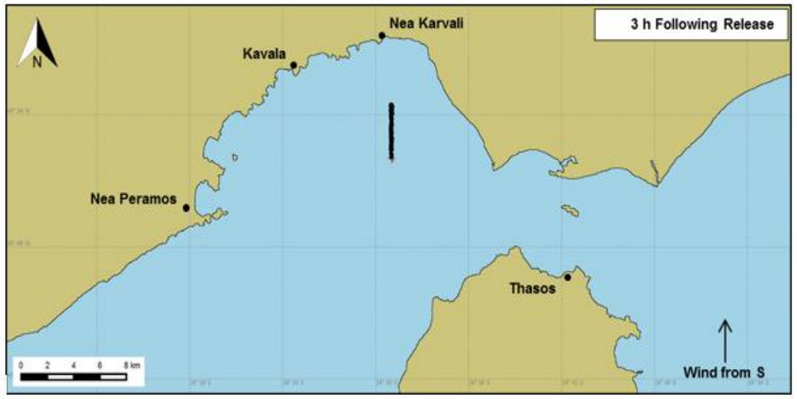


Figure 2: Pipeline 1B scenario. Detemrinistic results 3 hrs after release (max response time); 7 hrs after realease (min arrival time until beaching) and 30 hrs after realease (end of simulation)

Key: Red cross for the release point, track and beaching locations (red); final particle positions (black)

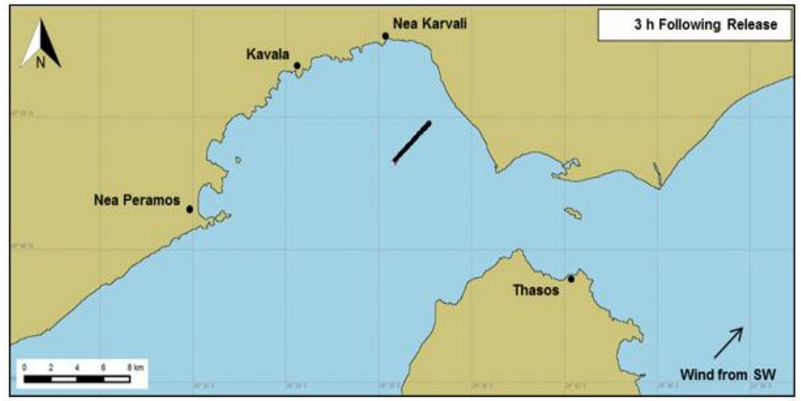


Figure 3: Pipeline 1D scenario. Detemrinistic results 3 hrs after release (max response time); 9 hrs after realease (min arrival time until beaching) and 25 hrs after realease (end of simulation)

Key: Red cross for the release point, track and beaching locations (red); final particle positions (black)

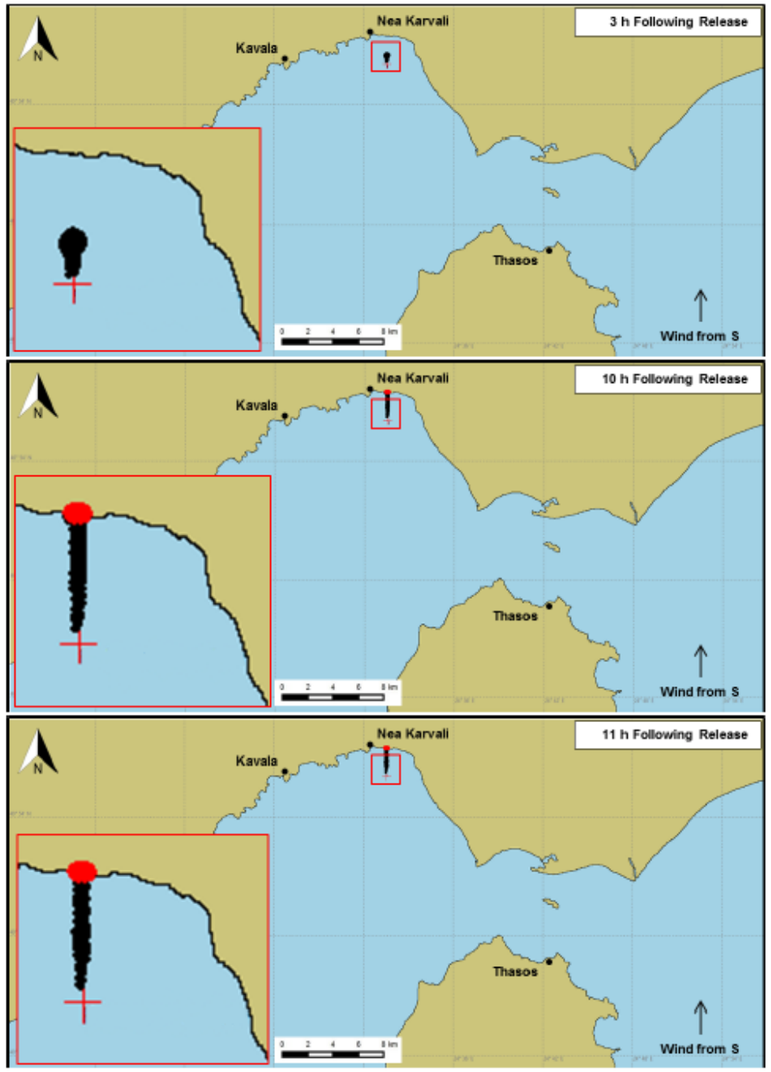


Figure 4: Loading buoy scenario. Deterministic results 3 hrs after release (max response time); 10 hrs after release (min arrival time until beaching) and 11 hrs after release (end of simulation)

Key: Red cross for the release point, red square: zoom; track and beaching locations (red); final particle positions (black)

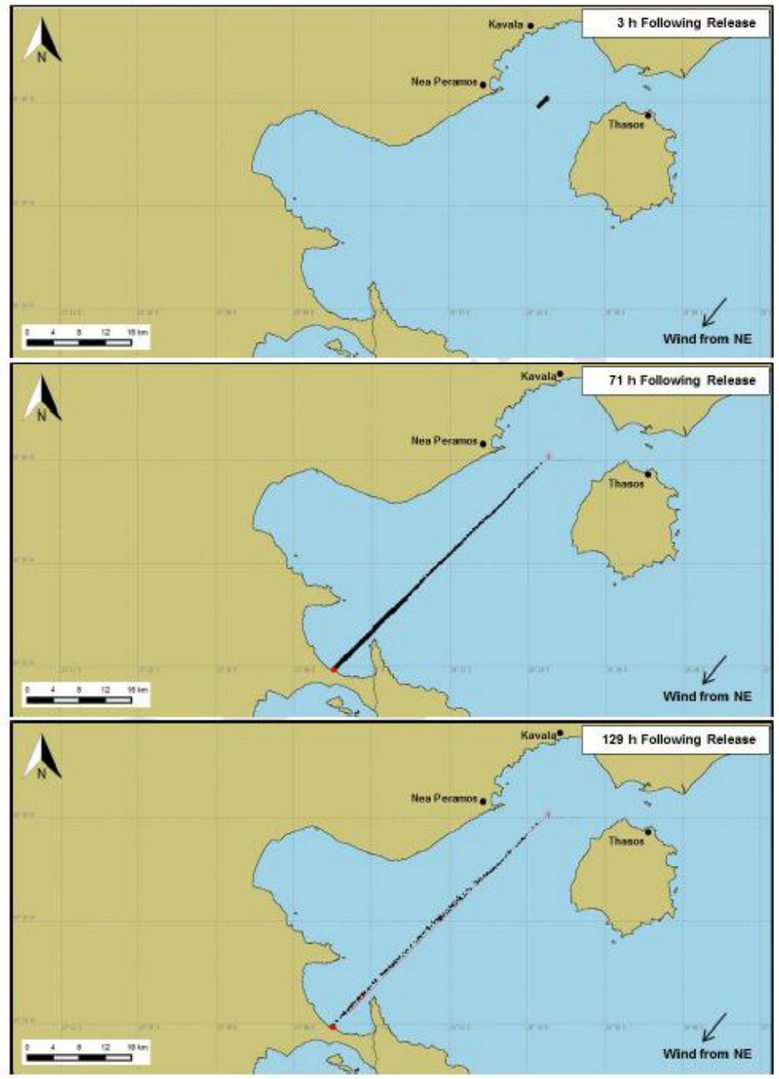


Figure 5: Well blow-out 1F scenario. Detemrinistic results 3 hrs after release (max response time); 71 hrs after realease (min arrival time until beaching) and 129 hrs after realease (end of simulation)

Key: Red cross for the release point, track and beaching locations (red); final particle positions (black)

6 ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

The following table summarises the findings of the detailed EIA process undertaken in relation to the Energean project and its potential effects on the physical, biotic and human environment. It is noted that no significance or negligible impacts are not included in this table. The potential interactions between project activities and environment and social receptors are subject to either standard recognised best practice mitigation measures or to impact specific. In general the mitigation proposed will be sufficient to reduce the effects of activities to below levels which will cause a significant impact.

Receptor	Activity	Project Rationale	Impact Significance	Mitigation
Construction				
Seabed	Burial of the pipelines and umbilical's	Local change in the morphological characteristics of the seabed.	Minor	It will be investigated the technical feasibility of bundling the three pipelines together so as to minimise the seabed impacted area.
Geological characteristics	Installation of permanent mooring	Smothering of a portion of the seabed, leading to localised decrease in sediment's nutrient content.	Minor	During drilling and with respect to seabed cuttings, conductor of 30" will be used instead of 36" in order to minimize volume of cuttings.
Water environment	Burial of pipelines and umbilical's	Increased turbidity	Minor	It will be investigated the technical feasibility of bundling the three pipelines together so as to minimise the seabed impacted area.
Benthic species	Installation of permanent mooring Installation of pipelines and umbilical's Burial of pipelines and umbilical's	Disturbance and in some cases relocation of benthic communities due to the increased water turbidity and/or smothering of a portion of seabed	Minor	During drilling and with respect to seabed cuttings, conductor of 30" will be used instead of 36" in order to minimize volume of cuttings It will be investigated the technical feasibility of bundling the three pipelines together so as to minimise the seabed impacted area.
Marine mammals	Operation of support vessels	Noise disturbance and risk of collision. Underwater noise may cause marine animals to alter their behaviour (such as	Moderate	Speed limitation of 20 knots will be defined in all boat movements under the responsibility of Energean.

Receptor	Activity	Project Rationale	Impact Significance	Mitigation
		diving, surfacing, vocalizing, feeding, and/or mating), move away from the area of noise, prevent marine animals from hearing important sounds (masking), cause hearing loss (temporary or permanent), or damage tissue.		Support vessel will have at least one experienced marine mammal observer (MMO) on-board and will have two if 24 hour operations are expected. The commencement of construction activities will be also advised by the MMO.
Marine mammals	Modifications to Delta (new risers/J tubes)	Noise disturbance	Minor	-
Socioeconomic Environment	Construction/Installation of the new facilities	Employment will increase during the construction phase of the project. Local contractors will be employed to assist in construction activities, thus supporting the local economy	Positive	
Operation				
Seabed	Seabed cuttings (0-400m)	Local change in the morphological characteristics of the seabed.	Minor	-
Water environment	Seabed cuttings (0-400m)	Increased turbidity.	Minor	-
Benthic communities	Maintenance of exclusion zones	The fishing prevention in the exclusion zones will impact positively the benthic community.	Positive	
Benthic communities	Seabed cuttings (0-400m)	Disturbance and in some cases relocation of benthic communities due to the increased water turbidity and/or local change in the seabed	Minor	-
Marine mammals	Maintenance of exclusion zones	By maintaining the operation of exclusion zones, fishing activities are prevented within those areas, increasing the fish populations, which in turn are the predominant food supply of marine mammals.	Positive	
Marine mammals	Installation of conductors (new wells)	Noise disturbance and risk of collision.	Minor	Conductor driving will not commence if marine mammals detected within 500 m of the

Receptor	Activity	Project Rationale	Impact Significance	Mitigation
	Spudding and drilling of wells, including cementing initial casings			activity or until 20 minutes after the last visual detection. Energean will examine the possibility to install conductors with vibropile equipment (lower noise levels.) rather than hammers.
Marine mammals	Operation of support vessels	Noise disturbance and risk of collision	Moderate	Speed limitation of 20 knots will be defined in all boat movements under the responsibility of Energean.
Social infrastructure (waste)	Cuttings treatment and disposal (400 - 3150 m)	Wastes will be managed by Accredited Waste Management Facilities and this may cause negative effect on their capacity for other users	Minor	Energean will audit the waste facility to make sure it has the required capacity before it sends the waste for further management / treatment.
Socioeconomic Environment	Operation of the existing & new facilities	The construction /installation activities will improve the life of the fields, allowing the company to retain the existing employment levels	Positive	
Abandonment phase				
Seabed	Existing platforms: dispersal of seabed cuttings from piles New platforms: removal of SIPs	Local change in the morphological characteristics of the seabed	Minor	-
Water environment	Existing platforms: Dispersal of seabed cuttings from piles	Increased turbidity	Minor	Feasibility assessment of trial lifting the cuttings to surface will be executed.
Benthic communities	Existing platforms: dispersal of seabed cuttings from piles New platforms: removal of SIPs	Disturbance to benthic communities on and around them (from direct physical disruption and increased turbidity).	Minor	Feasibility assessment of trial lifting the cuttings to surface will be executed.
Marine mammals	Sever conductors	Noise disturbance and risk of collision.	Moderate	The decommissioning activities will start with the observation of a MMO. Decommissioning will not commence if marine mammals detected within 500m of the activity or until 20 minutes after the last visual detection.

Receptor	Activity	Project Rationale	Impact Significance	Mitigation
Marine mammals	Operation of support vessels	Noise disturbance and risk of collision	Moderate	Speed limitation of 20 knots will be defined in all boat movements under the responsibility of Energean. Support vessel will have at least one experienced marine mammal observer (MMO) on-board and will have two if 24 hour operations are expected.
Marine mammals	Existing platforms: cut piles	Noise disturbance and harm	Major	Use cold cutting equipment during abandonment rather than explosives for removal of platforms as this method produces low noise levels. Decommissioning will not commence if marine mammals detected within 500m of the activity or until 20 minutes after the last visual detection. Impact will be reassessed and mitigation re-evaluated closer to the time and this is likely to reduce the significance of the impact.
Marine mammals	Existing platforms: remove jacket New platforms: removal of SIP	Destruction of this man-made habitat and potentially reduces the quality / abundance of the food supply for marine mammals.	Minor	-
Socioeconomic environment	All	Following abandonment of all platforms (existing and new), the existing workforce will need to find alternative employment	Minor	
Social infrastructure (waste)	Existing platforms	Wastes will be managed by Accredited Waste Management Facilities and this may cause negative effect on their capacity for other users	Minor	Energean will audit the waste facility to make sure it has the required capacity before it sends the waste for further management / treatment.
Unplanned events *The likelihood of the impact is very low especially the probability to reach the coast is calculated to be $2*10^{-6}$.* ***The impact likelihood was considered for the assessment of the significance.***				
Seabed	Oil spill unplanned	Elevated	Minor	Facility design and

Receptor	Activity	Project Rationale	Impact Significance	Mitigation
	event	concentrations of hydrocarbons may be noticeable in sediments close to the discharge point.		procedures Contingency Plan
Water environment	Oil spill unplanned event	Localized and significant negative effects on the water quality	Minor	Facility design and procedures Contingency Plan
Plankton and fish ecology Marine mammals Avifauna	Oil spill unplanned event	Toxic effects on plankton and fish. An oil spill may affect marine mammals through inhalation, ingestion, and dermal pathways. Each pathway could cause a suite of physiological responses that could compromise health as well as long-term survival and reproduction. Crude oil is toxic to avifauna and may lead severe damage to internal organs and mortality. Additionally, bird contact with oil causes feather oiling and therefore hypothermia, loss of buoyancy and ability to flight.	Moderate	Facility design and procedures Contingency Plan
Environmental protected areas	Oil spill unplanned event	Impacts on beaches and environmental protected areas and their objectives	Moderate	Facility design and procedures Contingency Plan
Benthic communities	Oil spill unplanned event	Toxic effects on benthic communities	Minor	Facility design and procedures Contingency Plan
Fishing activities, Tourism and livelihood	Oil spill unplanned event	In case that fish stocks are contaminated, there could be a loss of market confidence as people may be unwilling to buy fish caught in a contaminated area. The oil spill accident would have a long term impact to the wider touristic area of Kavala gulf due to the negative visitors' perception	Moderate	Facility design and procedures Contingency Plan

Receptor	Activity	Project Rationale	Impact Significance	Mitigation
Marine traffic	Oil spill unplanned event	Shipping longer routes and delays	Minor	Facility design and procedures Contingency Plan
Socioeconomic environment	Oil spill unplanned event	Negative economic impacts on the tourism industry and other livelihoods, fishing activities and shipping	Moderate	Facility design and procedures Contingency Plan
Technical infrastructures	Oil spill unplanned event	Oil spill will be managed by Accredited Management Facilities and may cause negative effect on their capacity for other users	Minor	Facility design and procedures Contingency Plan

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

The purpose of the Environmental and Social Management & Monitoring Plan (ESMMP) is to:

- Present an overview of the HSE Management System that is being implemented and will accordingly adjusted to continue in the upcoming project phases, to ensure systematic and effective execution of the environmental and social (E&S) commitments relevant to the construction phase of the Project, future operations, potential future developments as well as to the final decommissioning / abandonment phases, presented in the previous paragraph 2.8;
- Provide a summary of the relative role and responsibilities of Energean, the EPC and other contractors throughout the phases.
- Describe key impact management and monitoring commitments which are defined in more details in topic specific plans.

This document is a “live” document – Energean’s E&S Programme will continue to develop and evolve further in response to the different stages of project development and the outcomes of ongoing stakeholder engagement. This document will be reviewed regularly to ensure the approach to E&S management remains fit-for-purpose and continues to align with relevant good practice.

The ESMMP is supported by the following topic specific framework Management and Monitoring Plans (MMP) which define key measures to manage, mitigate and monitor impacts associated with the project. These will be developed into full plans and integreated into the HSE management system.

- Chemical use plan
- Waste management plan
- Stakeholder engagement plan (SEP)
- Chance finds procedure for cultural heritage
- Contingency Plan
- Health, safety and environment (HSE) management plan
- Traffic management plan
- General construction management plan (for your onshore works in pipeline assembly)
- Biodiversity and Wildlife management plan
- Pollution Prevention Management Plan

Energean is responsible for the environmental and social management of the construction and operation activities, to ensure that project commitments are implemented, and conforms to applicable environmental and social legal, regulatory and corporate requirements.

Energean's current Health, Safety and Environmental (HSE) Management System defines the principles to be followed by all employees and contractors associated with O&G fields exploitation business in Prinos and South Kavala fields and relating facilities and future developments. This system will be adapted to cover the proposed new planned infrastructure / operations.

Energean is committed to the Mitigation Hierarchy (for Health and Safety), and the Mitigation Hierarchy (for Environmental and Social Risks). This hierarchy will be adhered to when devising appropriate mitigation and management strategies and measures.

The 'Energean Force' Rig already used to drill existing wells is managed by a rig management team who has its own independent HSE MS already in place. Alignment of the plans, procedures and reporting requirements of the rig and Energean HSE MS has been achieved through the development of an HSE MS Bridging Document. The document defines clearly how all activities will be managed to ensure compliance with Energean overarching requirements.

Energean is responsible for the detailed design, procurement, construction and operation of the Prinos Development Project. Energean has appointed design contractors to undertake the detailed design of the project and a drilling contractor to manage the 'Energean Force' Drilling Rig that will drill the wells. In due course, Energean will issue technical invitation to bid documents for the various elements of the construction work scope.

Energean's existing and updated HSE MS will form the framework for managing social and environmental issues throughout construction, prior to the operation of the new facilities.

The aforementioned HSE MS will be used to deliver the Project ESIA commitments and coordinate and review the environmental and social performance of the Project at the construction stage.

Energean will operate the Project facilities using the established HSE MS that will be adjusted as described earlier to cover the construction phase. This will be further adjusted prior to commencement of Project's operations and transition plans will be developed to assist with the movement from the construction to existing HSE MS that will be updated accordingly to fit into the operations the new planned and future development facilities.

The updated HSE-MS will be used to operate the Project facilities in accordance with the ESIA commitments and applicable legal and regulatory standards and Energean's policy.

An outline of the monitoring programmes proposed for the construction and operation phases, is presented in the following tables. Monitoring process will enable Energean to understand how environmental performance will change over time and will facilitate improvements to the environmental and social management system.

Table 1: Outline of Monitoring Program during the Construction Phase

Receptor	Monitoring Task	Monitoring Parameter	Timing
Marine environment	Marine ecology inspection	Benthic analysis	Monthly
	Monitoring of marine water quality	Turbidity / Suspended solids Oil and grease	Weekly
	Monitoring of sensitive marine fauna	Presence of marine mammals and birds – visual monitoring	Continuous
	Identification and reporting of leakage events	Number of leakage events caused during the construction	Continuous
Noise	Noise monitoring at direct interference (within 500 m)	Day and night noise levels	Weekly
Working conditions, health and safety	Health and Safety (H&S) monitoring and audits. H&S Performance evaluation Personal Protected Equipment monitoring	Total recordable incidents, lost time incidents and other H&S indicators. Records verifying the condition of Personal Protected Equipment	Weekly
	Maintain grievance mechanism Analyse workers and community grievance trends Maintaining training records	Grievance mechanism records Training records	Monthly

Table 2: Outline of Monitoring Program during the Operation Phase

Receptor	Monitoring Task	Monitoring Parameter	Timing
Marine environment	Monitoring of marine water, seabed morphology, integrity of the pipelines and marine ecology at direct interference (within 500 m)	Physicochemical analysis of seawater and benthos. Analysis of benthic communities Visual inspection via ROV or diving survey	Every 12 months for sample analysis Every 3 years for visual inspection
	Identification and reporting	Number of leakage events	Continuous

Receptor	Monitoring Task	Monitoring Parameter	Timing
	of leakage events	caused by the activity	
Air quality	Air emissions monitoring through a Continuous Emissions Monitoring (CEM) System	Temperature Pressure drop H_2S Combustible gases	Continuous Continuous detection monitoring Continuous detection monitoring
Noise	Noise monitoring at direct interference (within 500 m)	Day and night noise levels	Every 6 months for the first two years
Working conditions, health and safety	Inspection of the emergency and detection systems	Maintenance check, services and record verifying the condition of the emergency shutdown, fire detection, H_2S detection, combustible gas detection and fire water systems	According to the manufacturer
	Inspection of the Personal Protected Equipment (PPE) and the safety equipment	Visual inspection and records verifying the condition of the safety equipment (life rafts, life jackets, flares, smoke canisters)	Monthly
	Monitoring of Health and Safety implementation by the workforce		Monthly

Table 3: Outline of Monitoring Program during the Decommissioning Phase

Receptor	Monitoring Task	Monitoring Parameter	Timing
Marine environment	Marine ecology inspection	Benthic analysis	Monthly One month after direct interference
	Monitoring of marine water quality	Turbidity / Suspended solids Oil and grease	Weekly One month after direct interference
	Monitoring of sensitive marine fauna	Presence of marine mammals and birds – visual monitoring	Continuous

Receptor	Monitoring Task	Monitoring Parameter	Timing
	Identification and reporting of leakage events	Number of leakage events caused during the construction	Continuous
Noise	Noise monitoring at direct interference (within 500 m)	Day and night noise levels	Weekly
Working conditions, health and safety	Health and Safety (H&S) monitoring and audits. H&S Performance evaluation Personal Protected Equipment monitoring	Total recordable incidents, lost time incidents and other H&S indicators. Records verifying the conditioned of Personal Protected Equipment	Weekly
	Maintain grievance mechanism Analyse workers and community grievance trends Maintaining training records	Grievance mechanism records Training records	Monthly