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Appropriate Assessment (AA)

Tender bid for the undertaking of the permitting activities including environmental impact studies and related actions for the Malta-Italy Gas pipeline interconnection

Technical report

AIS REF. NO: PRJ-ENV369
CLIENT REF. NO: CT3109/2018
THIRD VERSION

Publication Date

13 February 2020

This tender is being part-financed by the European Union under the Connecting European Facility (CEF) programme for 2014-2020

Co-financed by the Connecting Europe Facility of the European Union

DOCUMENT REVISION HISTORY

Date	Revision	Comments	Authors/Contributors
12/12/2019	1.0	First version	Prof Alan Deidun Dr Joe Doublet Sacha Dunlop
31/01/2020	2.0	Second version	Prof Alan Deidun Dr Joe Doublet Sacha Dunlop
13/02/2020	3.0	Third version – approved for submission	Prof Alan Deidun Dr Joe Doublet Sacha Dunlop

AMENDMENT RECORD

Approval Level	Name	Signature
Internal Check	Sacha Dunlop	
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1.0 Executive Non-technical summary

An Appropriate Assessment (AA) report is hereby being presented in relation to PA 08757/17. This application is entitled "*construction of the Malta-Italy gas pipeline EU Project of Common Interest, including a terminal station at DPS, an onshore HDD route through Delimara Peninsula and the laying of an offshore 22" diameter pipeline extending up to Gela, Sicily, Site at Delimara Power Station and offshore route within the Malta Territorial Waters, Delimara, Marsaxlokk, Malta*".

The scope of the AA is to determine whether the Scheme or any part thereof will have a significant impact on the integrity of the above mentioned protected sites and any relevant ecosystems, habitats and species covered by the provisions of the Flora, Fauna and Natural Habitats Regulations (SL 549.44).

The study focuses on the Maltese part of the Scheme only i.e. the area of land reclamation at Marsaxlokk bay, the trenchless tunnel route through the Delimara peninsula and the offshore pipeline until the median line between Malta and Sicily.

Most of these potential impacts will take place at sea since the only constructions which will take place on land will be in an area adjacent to the existing DPS which still has to be reclaimed.

The pipeline will cross the following Marine Protected Areas:

- *Żona fil-Baħar fil-Grigal* (MT 0000107) designated as an SPA via GN No. 1311 of 2016, in accordance with the Flora, Fauna and Natural Habitats Protection Regulations, 2016 (S.L. 549.44);
- *Żona fil-Baħar fil-Lvant* (MT 0000108) designated as an SPA via GN No. 1311 of 2016, in accordance with the Flora, Fauna and Natural Habitats Protection Regulations, 2016 (S.L. 549.44);
- *Żona fil-Baħar fil-Lbiċ* (MT 0000111) designated as an SPA via GN No. 1311 of 2016, in accordance with the Flora, Fauna and Natural Habitats Protection Regulations, 2016 (S.L. 549.44).

The Terms of Reference (ToRs) for this AA were issued by the Environment and Resources Authority (ERA) in March 2018 (refer to Appendix I). In accordance to these ToRs, the screening process of the scheme determined that an AA is required as per Article 19(1) of the Flora, Fauna and Natural Habitats Protection Regulations, 2006 (SL 549.44), given that the scheme may cause significant impacts on the abovementioned Marine Natura 2000 sites.

The current study concludes that the anticipated marine ecology impacts of the proposed development are overall insignificant, especially with respect to the following protected species: *Ophidiaster ophidianus* (Purple starfish), *Centrostephanus longispinus* (Hatpin urchin) and *Palinurus elephas* (Common spiny lobster), largely due to the sparse but wide distribution of these species' occurrence. However, the current study has identified a number of significant marine ecology impacts of the proposed development, specifically on the following protected species and habitats:

Within nearshore waters, for *Cystoseira* cfr. *brachycarpa*, *Posidonia oceanica* and *Cymodocea nodosa* meadows, significant impacts arising from the excavation of the transition pit are expected (although this is the least impactful of pipeline burial technologies available), whilst in offshore waters, the only phytobenthic species to be significantly impacted are *Lithothamnion minervae* and *Lithothamnion corallioides*, through the installation of pipeline supporting and pre-lay cable-crossing features. *Posidonia oceanica* and *Cymodocea nodosa* will probably be impacted significantly at habitat/meadow level through ancillary anchoring activities, with such activities impacting also sessile species of high conservation importance such as *Antipathes dichotoma, Eunicella cavolinii* and *Axinella polypoides. Palinurus elephas* (European spiny lobster) is the only protected species expected to be significantly impacted by submarine noise generation during the construction phase.

These impacts can be largely mitigated through:

(i) the selection of less detrimental project design alternatives, and
(ii) the implementation of appropriate mitigation measures

although a degree of residual impacts are still expected to persist.

The construction phase of the scheme will also have a temporary impact on the three Marine Protected Areas and on the populations of the Yelkouan Shearwater, Scopoli's Shearwater and Storm Petrel. The extent of such impact is not clear and much depends on the levels of impacts resulting from the works. From the available information at the time of writing one assumes that the level of impacts should be insignificant and of a transient nature. However, one cannot completely exclude the possibility that there would be a temporary drop in the populations of any of the three species in any one of the nearby breeding areas during the construction period.

Due to the temporary nature of impacts, one can safely assume that any affected avifauna species would be able to recover in the following years. Hence monitoring of the respective populations should start prior to works and continue for the following years. This would ensure a clear picture of the effects such works would have on the population of the species. In view of the above the Scheme shouldn't have any permanent negative effect on the integrity of the three Marine Protected Areas, namely Żona fil-Baħar fil-Lbiċ, *Żona fil-Baħar fil-Lvant* and *Żona fil-Baħar fil-Grigal* provided the recommended mitigation and monitoring measures are in place.

2.0 Project Description

The project shall connect Malta to the Trans-European Gas Network in Sicily. The primary aim of the project is to import gas from the Italian National Gas network via an approximately 159km long pipeline between Delimara (Malta) and Gela (Sicily) of which approximately 151km is subsea.[1] The length of the onshore pipeline section in Delimara is about 700m and will be connected to a new Terminal Plant by means of a trenchless construction method with the offshore exit target point at approximately 42m below mean sea level. Although the preferred construction method is still under evaluation, the Front End Engineering Designers (FEED) have determined that the microtunnelling solution is the preferred option. A degree of preliminary trenching is required at the target exit point to facilitate the entry of the pipeline from the seafloor into the trenchless borehole. The seabed shall be reinstated after the 22" pipeline installation is completed. The water depth of the marine proportion of the site ranges from 42m (at the exit in Delimara) to 158m at the deepest point to 30m at nearshore Gela, from which point onwards towards Sicily the pipeline is buried under the seabed.

Once the project is implemented, the gas pipeline would provide a more reliable source to supply natural gas to Malta, eliminating the need for the Floating Storage Unit (FSU) recently installed to supply natural gas to the reciprocating internal combustion engine plant and the new gas turbines at the Delimara Power Station. The project will contribute to market integration and thus boost competitiveness. Use of sustainable energy will be supported by the project and will contribute towards the reduction of GHG emissions primarily from the LNG shipping and regasification process which currently take place as part of the FSU system.

The gas pipeline project shall be designed to operate in bidirectional mode with the first phase supplying gas from Sicily to Malta and depending on market developments, can in the future be used to supply gas from Malta to Italy. The phase 1 of the pipeline project shall have an estimated capacity of approximately 1.2 billion standard cubic meters per year, with a guaranteed maximum flow of 141,000 Sm^3/hour.

The pipe will make contact with land in Malta on the eastern side of the Delimara peninsula at a depth of approximately 42m below sea level. It will then transect the peninsula and connect to the Delimara Power Station via a trenchless excavation method. The Power Station needs to be extended in order to accommodate the additional infrastructures required for the operation of the pipeline. In order to do this, it is necessary to reclaim an area of 8,000m^2 from the sea.

The Sicilian terminal station will be constructed within the Gela municipality at 37°04'51.80" N; 14° 19'01.00" E. The onshore pipeline route in Sicily is expected to be 7km long, and confined within the Gela municipality. Since the onshore pipeline in Sicily shall cross two railway lines, a number of roads and the Gela-Ragusa ethylene pipeline, three block valve

[1] The project was confirmed as a "project of common interest" (PCI) and re-confirmed in the 2nd and 3rd PCI lists. The project was submitted as a candidate for the 4th PCI list of 2019.

stations shall be installed onshore Sicily to isolate the pipeline sections as required by Italian legislation .

On the Sicilian shore, several construction methodologies, including HDD are being considered by the FEED (Front End Engineer Design) contractor, Techfem/SPS. For protection purposes, the underwater pipeline shall be covered when passing through waters shallower than 30m, while in deeper waters, the pipeline shall be laid on the seabed. The pipeline route is located in relatively shallow waters on the Malta-Sicily underwater ridge. Such a route minimises stresses on the pipeline during both the laying of the pipe as well as during the operation of the pipeline itself.

The proposed development, subject to the EIA and hereinafter referred to as the "Scheme", involves the following interventions (Figure 1): [2]

- Construction of a 22" diameter gas pipeline between Delimara, Malta and Gela Sicily
- The construction of a terminal station (land reclamation) at Delimara Power Station
- Onshore tunnel route across the Delimara Peninsula

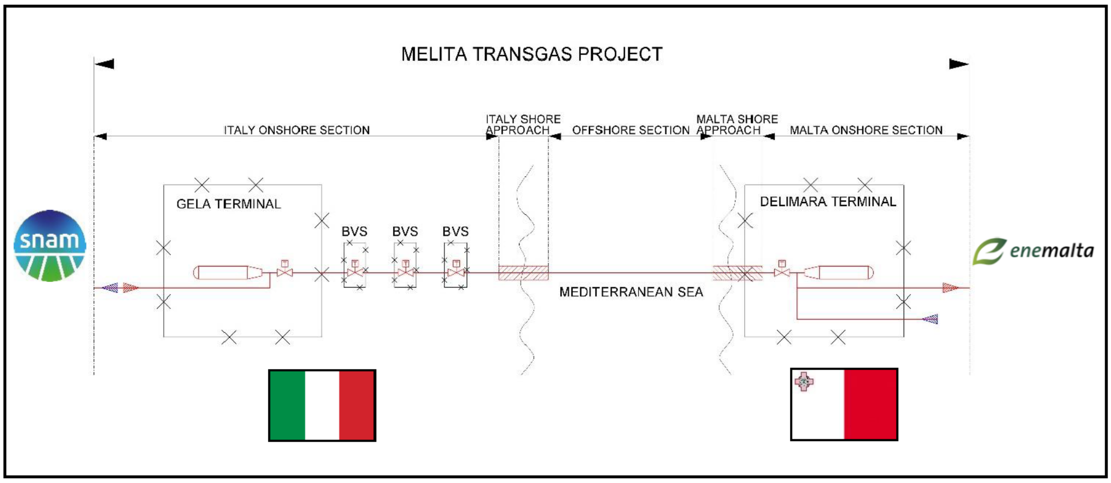


Figure 1: Project schematic

[2] *KP numbers in this figure relate to the kilometre point of the project with KP 0 being the position of the terminal station in Gela. Figures produced by Lighthouse SpA consider KP 0 as the shoreline in Gela. There is a difference of approximately 7.1km between the two systems.*

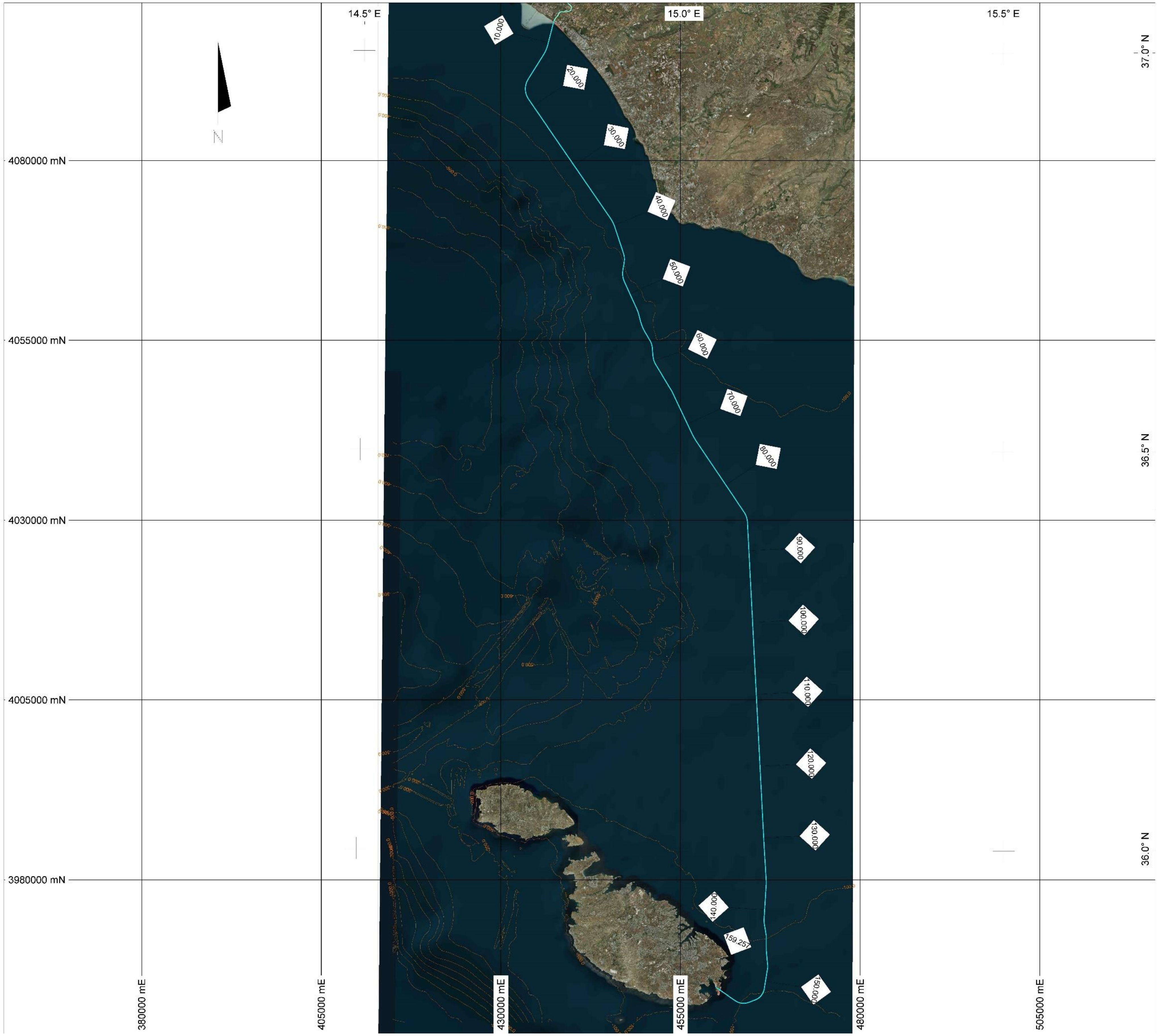


Figure 2: Site plan showing the offshore route corridor

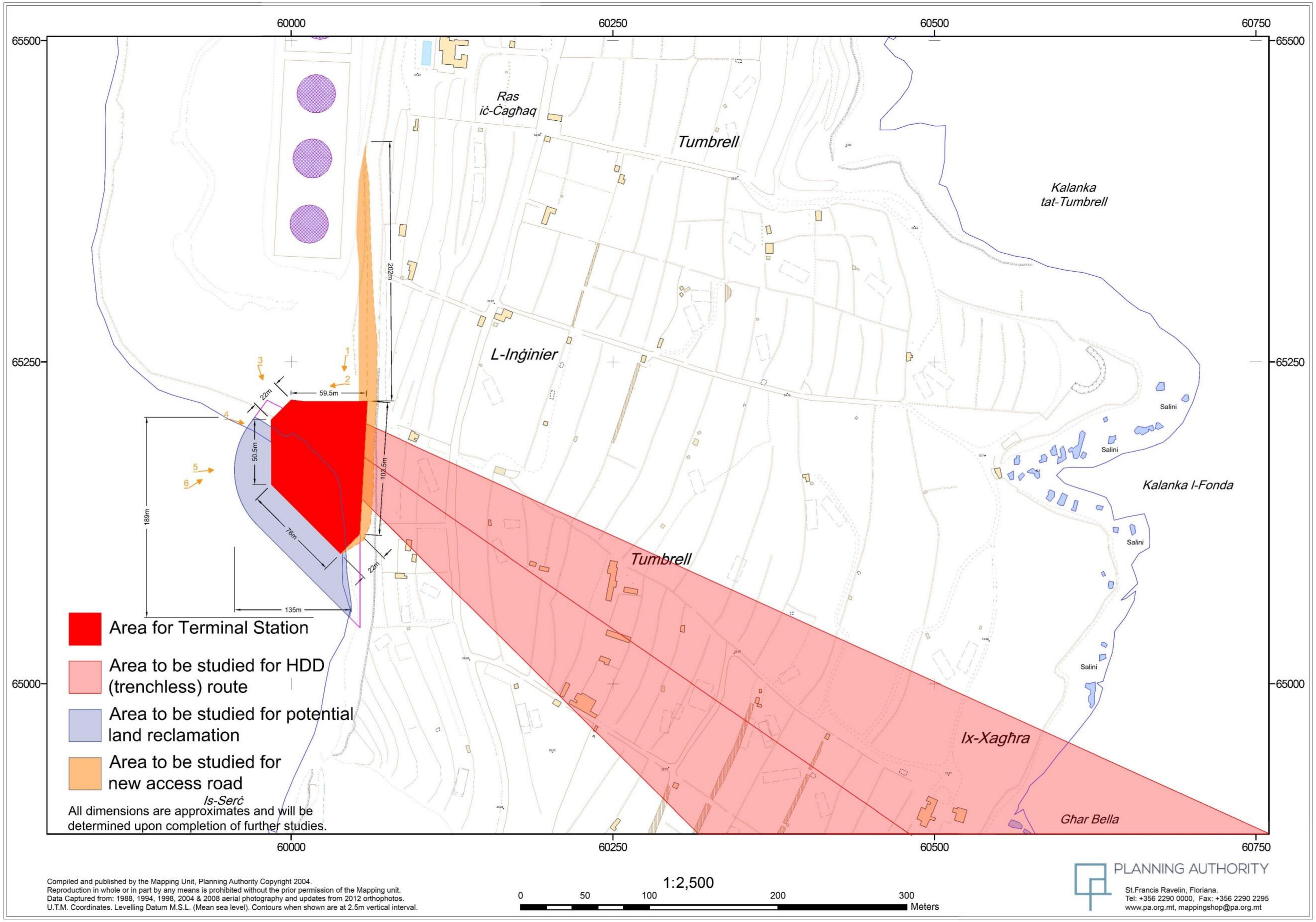


Figure 3: Site plan showing the areas for the terminal station, land reclamation study area and onshore trenchless study area

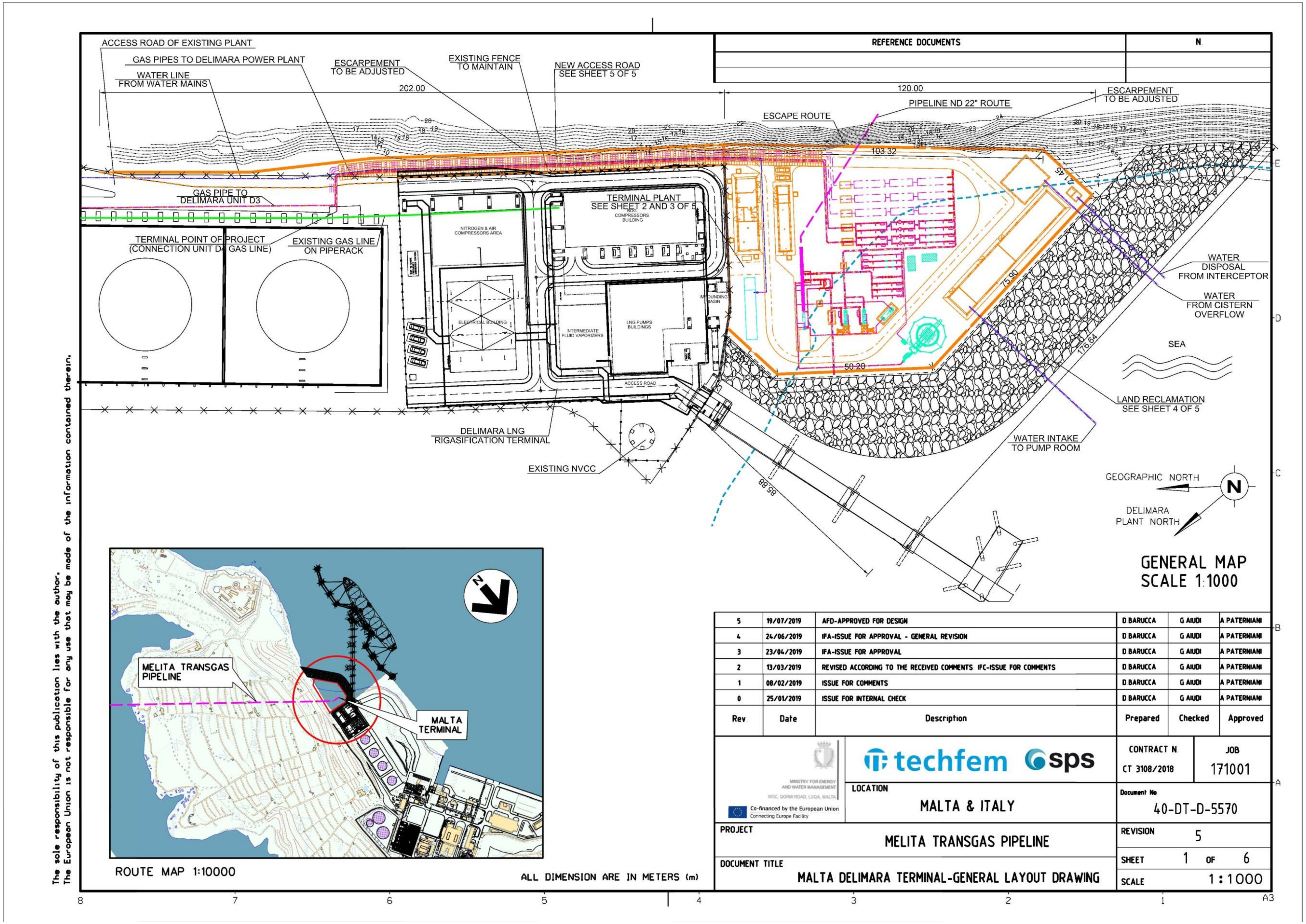


Figure 4: Site plan for the proposed Malta terminal and land reclamation area

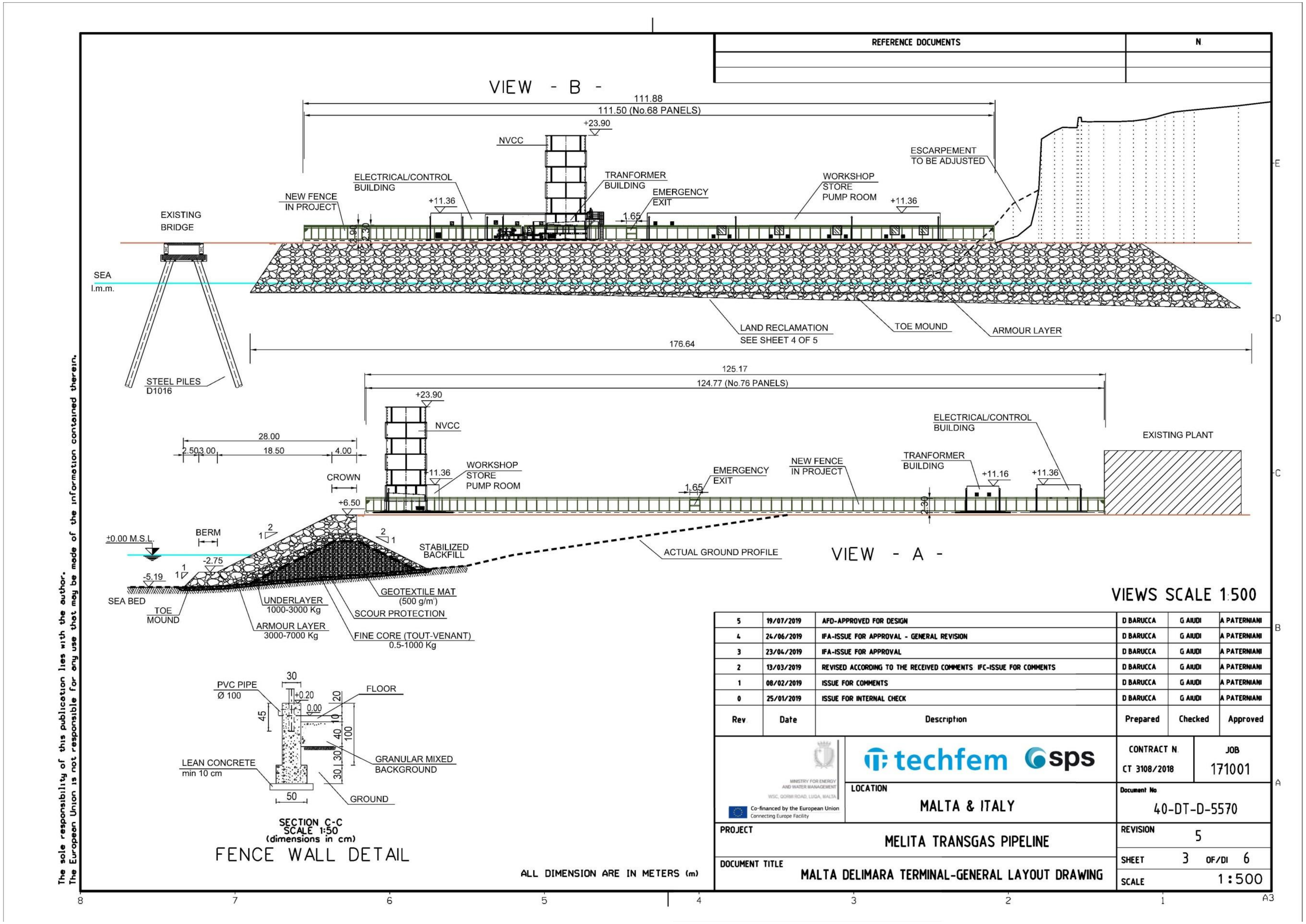


Figure 5: Sections for the proposed Malta terminal

2.1 Study methodology

2.1.1 Marine Study

The Area of Influence (AoI) for the marine component of the study encompasses ten individual sampling stations, as mapped in Figure 6. The offshore corridor is 2km wide (1km on each side of the route) for the first nautical mile and 1.2km wide (600m on each side of the route) for the remaining offshore section.

The proposed locations for the various pelagic and benthic metrics were formulated in order to ensure partial coverage of the confines of the designated *Żona fil-Baħar fil-Grigal* (MT0000107), *Żona fil-Baħar fil-Lvant* (MT0000108) and *Żona fil-Baħar tal-Lbiċ* (MT0000111) Special Protection Areas (as identified within the Flora, Fauna and Natural Habitats Protection Regulations, 2006 [S.L. 549.44]), as well as locations positioned outside these MPAs and locations putatively harbouring seagrass meadows (gauged along bathymetric lines).

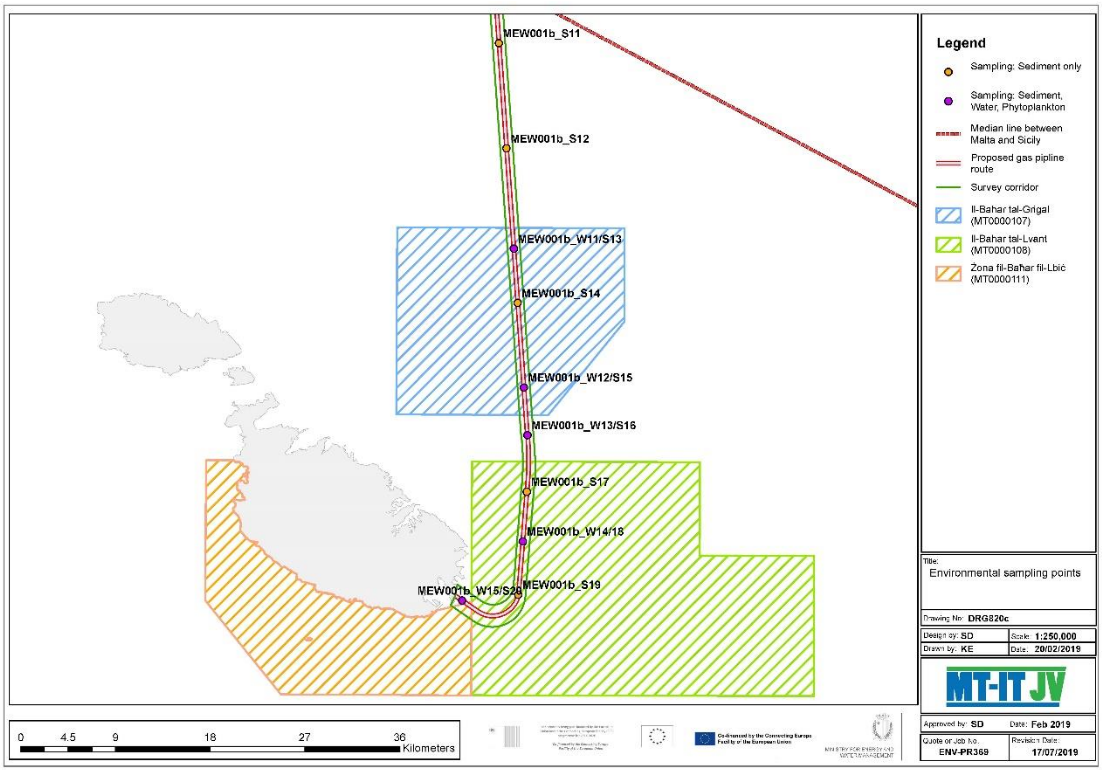


Figure 6: Locations of the ten environmental sampling stations for the water column and benthic metrics

The marine study presented in this report contains the following assessments:

- description of the elements of the proposed project which are expected to give rise to significant impacts on site;
- identification of species listed under Habitats and Birds Directives and an accurate mapping out of their distribution within the Area of Study shown in Figure 6, besides benthic assemblages of conservation importance, including seagrass meadows, coral formations, underwater caves, reefs and maerl assemblages. The occurrence of indicator species, useful for defining the ecological quality and conservation status

of the marine area under study, will be noted. Classification of recorded species and habitats will be made according to recognised conventions, including the EUNIS, Palaearctic and the RAC/SPA classification systems of Mediterranean marine benthic habitats, as adapted for the Maltese context within Borg et al. (2013).

Field sampling was carried out by Lighthouse SpA as described below:

- given the anticipated sea depths to be encountered during the survey and given the sheer extent of the AoI, most of the proposed marine ecology field sampling exercise was conducted via Remotely-Operated Vehicle (ROV) transects;
- a total of eight (8) ROV transects were implemented nearshore Malta, in a staggered fashion (at 200m intervals), whose exact length and positioning was determined during the preliminary marine route survey. Additional ROV footage was also collected in the offshore section within the benthic communities of conservation importance. Voucher photos from the collected ROV footage were reproduced within the final report;
- water column samples were collected through the deployment of a 5L Niskin bottle at prescribed sampling locations (5 locations x 3 replicates), pursuant to the characterisation of chlorophyll a and nutrient baseline values in the sampled areas;
- Replicates for each of the samples were as follows: three replicates for sediments, collected at one depth; and three replicates for water, collected at two different depths;
- Both water and sediment samples were analysed by an accredited (UNI CEI EN ISO/IEC 17025:2018 & ISO/IEC 17025:2017) laboratory.

As mentioned above, three replicates of sediments were collected at each station. The box corer was deployed a second time in case of insufficient results (i.e. not enough to fulfil requirements from laboratory). If, after the second deployment, the amount of material collected was still not enough to fulfil requirements from laboratory, a grab sampler was used to acquire superficial samples.

Following the baseline survey, the following indicators were used to gauge possible impacts relevant to the ecological status of the marine environment in the AoI, including:

- Species richness counts
- Other diversity counts, such as diversity indices and evenness measures
- The density of keystone species present on site, such as the extent of seagrass meadows and macroalgal species, and of indicator species (to be identified for the site after collection of baseline data)
- The presence of regionally and/or locally protected species, namely those listed in Annexes II-IV of the Habitats Directive and in relevant schedules of LN 311 of 2006 and the RAC/SPA Convention
- The presence of Red Data Book and other protected species
- The presence of regionally and/or locally protected habitats, namely those listed in Annexes I of the Habitats Directive and in relevant schedules of LN 311 of 2006 and the RAC/SPA Convention

2.1.2 Avian Study

The Area of Influence (AoI) for the avian component of the study will encompass a 2.5km buffer zone around the entry point of the gas pipeline at Delimara, as indicated in Figure 7.

Desktop studies will also be carried out on the three Natura 2000 SPA sites: MT0000107 *Żona fil-Baħar fil-Grigal*, MT0000108 *Żona fil-Baħar fil-Lvant,* MT0000111 *Żona fil-Baħar tal-Lbiċ*. Since MT0000111 is only partially covered by the proposed scheme, the assessment will focus on the localised impacts of the project, given that the area covered by this Natura 2000 site is extensive.

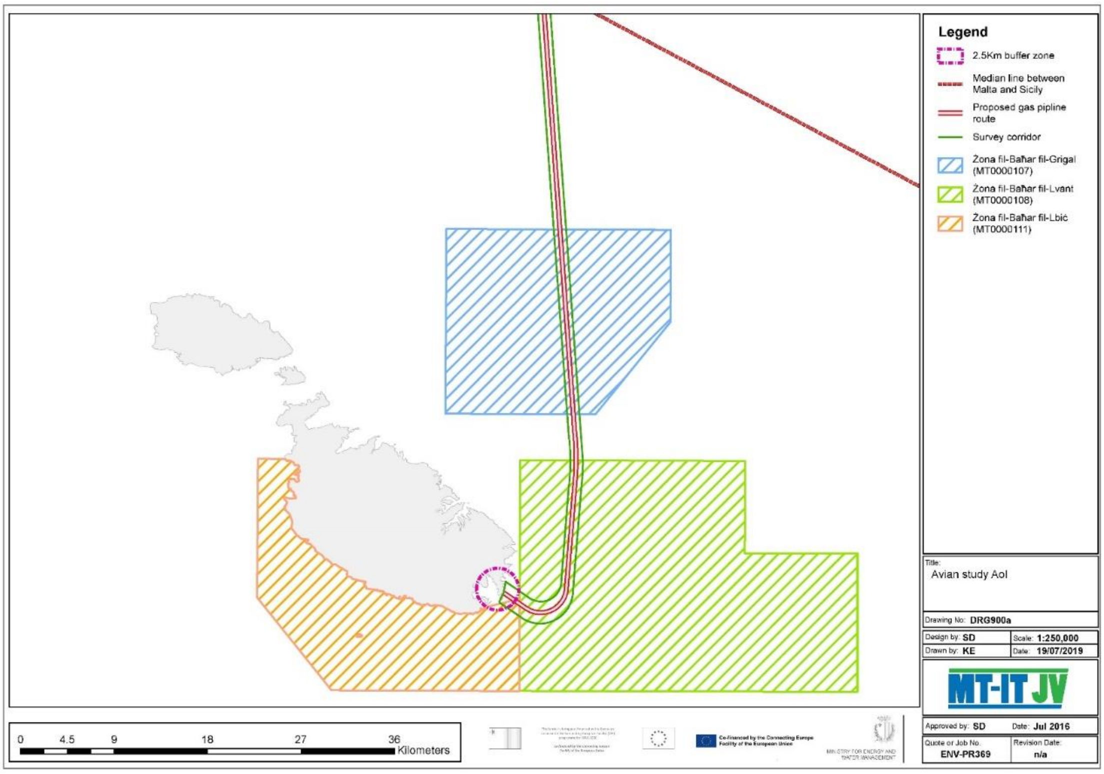


Figure 7: Area of Influence for avian study

Since there have been various similar studies in the area in recent years there is a good amount of readily available information which can be used in this part of the study. This part of the study will mainly utilise existing data from these aforementioned studies together with available records from birdwatching in the surroundings areas of the Delimara Peninsula. Existing and available data sources include:

- Marine Natura 2000 Standard Data Form and SPA Map for Zona fil-Bahar fil-Lvant (MT0000108) (ERA, 2018);
- Data on birds from BirdLife Malta, their journal *Il-Merill* and other local ornithologists;
- The Breeding Birds of Malta (Sultana et al., 2011), Malta Breeding Bird Atlas (Raine et al., 2008) and Important Bird Areas of EU Importance in Malta (Borg & Sultana, 2004);
- European Birds of Conservation concern-populations, trends and national responsibilities (Birdlife International, 2017); and
- Environmental Impact Assessment reports for projects carried on the Delimara Peninsula.

The Strategic Plan for the Environment and Development (SPED) (2015), the Marsaxlokk Bay Local Plan (MBLP) and Area Policy Maps (PA, 1995) and the Rural Policy and Design Guidance (RPDG) (MEPA, 2014) will also be consulted to identify relevant policies and site conservation objectives.

The designation of species will be indicated in accordance to the relevant schedules in Conservation of Wild Birds Regulations (S.L.549.42). The Species of European Conservation Concern (SPECs) system found in Birdlife (2017) will be used to identfy the status of the species recorded in the area.

3.0 Site Description

The description will only concern the scheme relevant to the Malta side.

The site where the Terminal Plant for the pipeline will be built is located adjacent to the Regasification Plant at the DPS (Figure 4). A new internal access road will be built and land reclamation will also take place along the existing shoreline. The base of the plant will be about 6.50m above sea level. The gas pipeline will cross underground the *Delimara* peninsula between the Terminal Plant and the seaward side along the east coast. This will be done through a micro-tunnelling borehole which will surface at around 42m below sea level about 600m offshore. The pipeline will continue its pathway underwater until it reaches the shores of Gela. Along its pathway in Maltese waters, the pipeline crosses three Marine Protected Areas (Figure 8) which are:

- *Żona fil-Baħar tal-Grigal* (MT 0000107) designated as an SPA via GN No. 1311 of 2016, in accordance with the Flora, Fauna and Natural Habitats Protection Regulations, 2016 (S.L. 549.44);
- *Żona fil-Baħar fil-Lvant* (MT 0000108) designated as an SPA via GN No. 1311 of 2016, in accordance with the Flora, Fauna and Natural Habitats Protection Regulations, 2016 (S.L. 549.44);
- *Żona fil-Baħar fil-Lbiċ* (MT 0000111) designated as an SPA via GN No. 1311 of 2016, in accordance with the Flora, Fauna and Natural Habitats Protection Regulations, 2016 (S.L. 549.44).

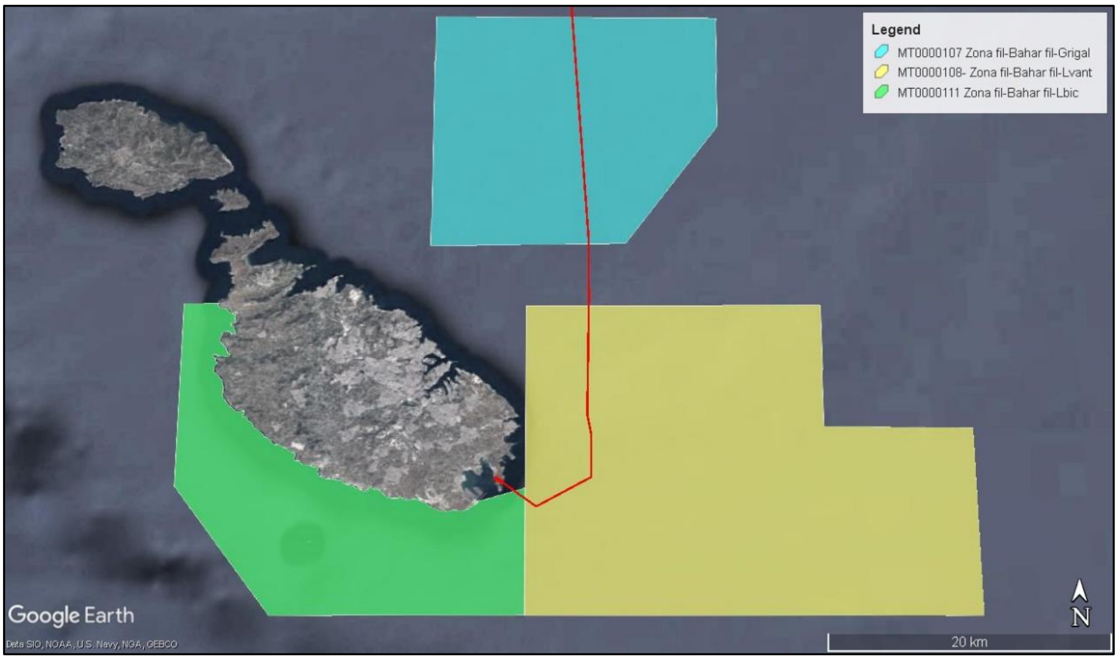


Figure 8: Aerial view showing gas pipeline route in relation to MPAs (source: Google Earth, 2019)

3.1 Marine study: Benthic domain

The AoI is located within the continental shelf area of the Malta plateau within the Malta-Sicily Channel, which is the seaward extension of the Hyblean Plateau of mainland Sicily. The

Hyblean Plateau, in turn, represents the northernmost extremity of the Tunisian Platform, which is located at the interface between the African and Eurasian plates. Large swathes of the same shelf area consist of a gently-sloping seabed characterised by fine circalittoral muds.

3.1.1 Desktop literature review

3.1.1.1 MEDITS trawl surveys

Terribile et al. (2016) have analysed the results of the MEDITS trawl surveys conducted within 43 Malta's Fisheries Management Zone (FMZ) stations over the 2009-2010 period, some of which fall within the proposed gas pipeline trajectory, as indicated in Figure 9.

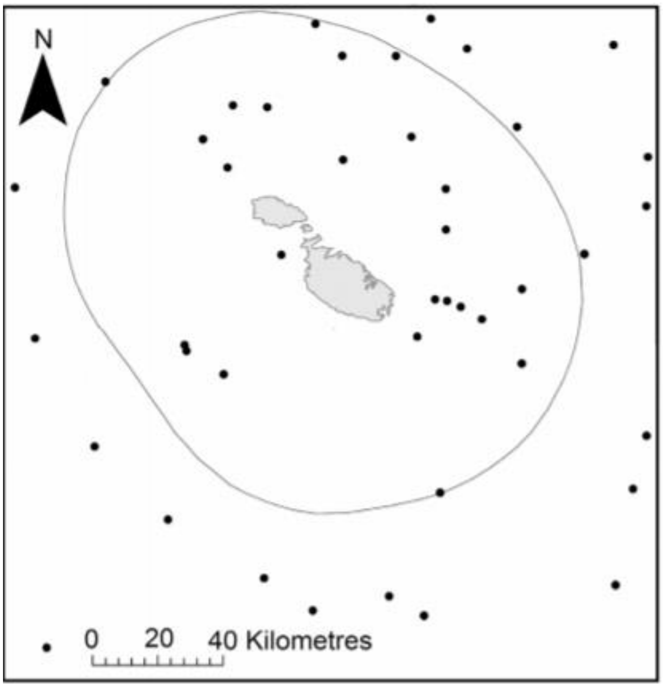


Figure 9: MEDITS trawl surveys assessed by Terribile et al. (2016)

Given that the itemised list of benthic species recorded at each MEDITS station is not provided by Terribile et al. (2016), one can only infer the geographical origin of each recorded species through the water depth range at which it was found. As a result, the following gorgonian species of conservation importance:

- *Callogorgia verticillata*
- *Funiculina quadrangularis*
- *Isidella elongata*
- *Maasella edwardsi*
- *Pennatula rubra*
- *Pteroeides griseum*

could potentially have been recorded at the MEDITS stations which correspond to the gas pipeline AoI. The following gorgonian species:

- *Lophelia pertusa*

- *Desmophyllum dianthus*

which have also been recorded within the same study, all of conservation importance, can be ruled out for the gas pipeline AoI, given their typical water depth of occurrence.

3.1.1.2 Other published studies and anecdotal information on coral species of conservation importance

Corals of conservation importance known to date from Maltese waters include:

a. Scleratinian (hard coral) species belonging to the *Desmophyllum, Dendrophyllia, Lophelia and Madrepora* genera, as well as
b. Non-scleratinian anthipatharian (black and false black coral) species such as *Leiopathes glaberrima*, *Antipathes* spp. And *Savaglia (=Gerardia) savaglia*, and
c. Gorgonians (sea fans and soft corals) such as *Corallium rubrum, Paramuricea clavata, Callogorgia verticillata, Eunicella* spp., *Isidella elongata*, *Viminella flagellata, Pteroeides griseum* and *Pennatula rubra*
d. Sea pens, including *Funiculina quadrangularis*

Most of these species (example: *Lophelia pertusa*) are bathymetrically excluded from the AoI. One of the few coral species of conservation importance recorded from maerl grounds identified to the north-east of the island of Malta as part of a land reclamation feasibility study is *Eunicella cavolonii*.

Those species whose typical broad-range bathymetric range of occurrence corresponds with the AoI (example: *Corallium rubrum, Paramuricea clavata, Madrepora oculata*) have always, to date, been recorded exclusively from circalittoral areas off the western and south coast of Malta (e.g. Schembri et al., 2007; Freiwald et al., 2009; Knitweiss et al., 2019) and are in fact absent from the species lists cited by Terribile et al. (2016) for MEDITS trawling stations located within the current AoI.

3.1.1.3 Delimara Power Station extension

The EIA and AA studies conducted in relation to the extension of the Delimara power station (PA 3152/05) provide a benthic habitat map (reproduced below as Figure 10) for the outer reaches of Marsaxlokk Bay, in close vicinity to the infralittoral area identified for land reclamation purposes at the gas terminal facility.

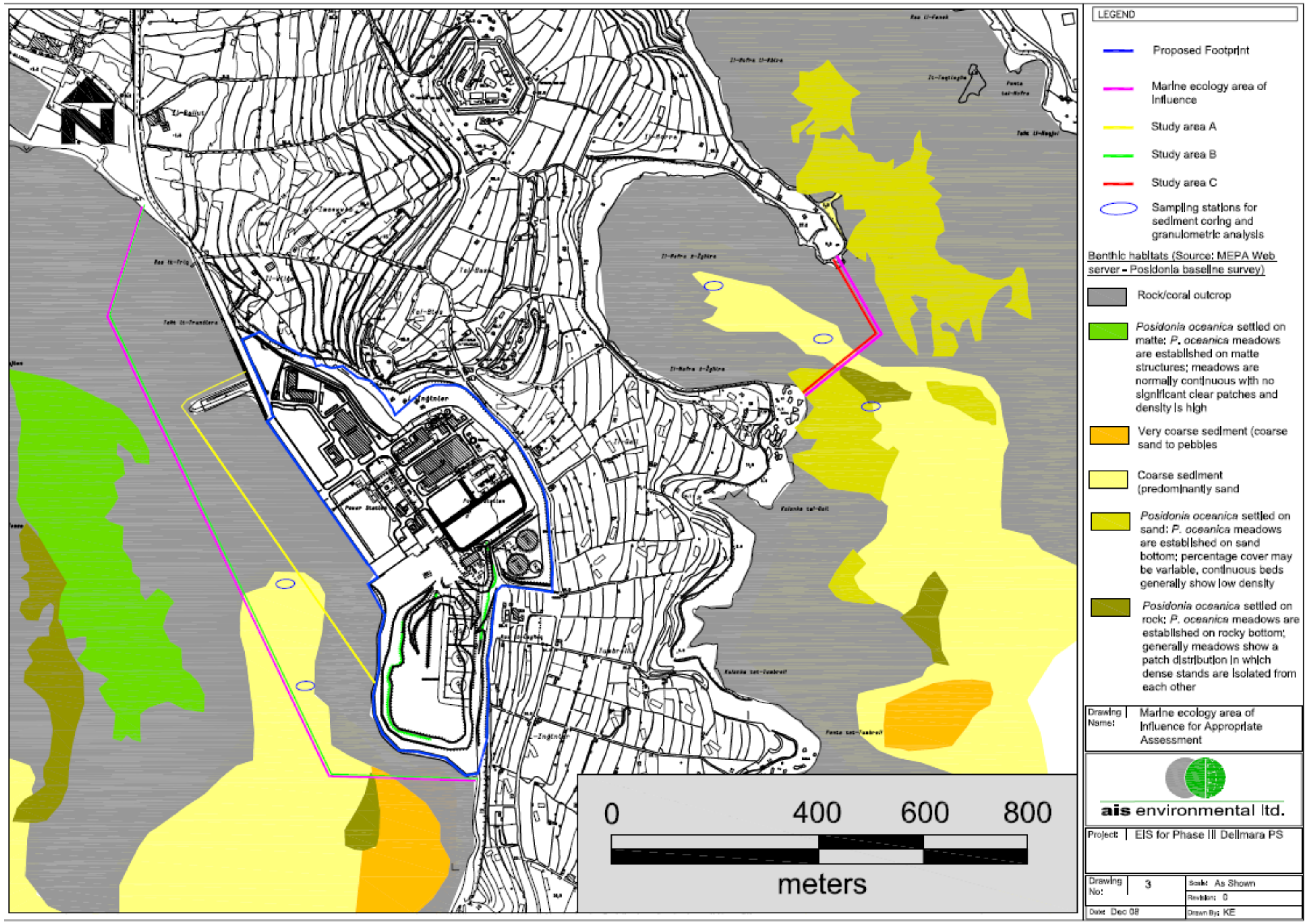


Figure 10: Benthic habitat map for Marsaxlokk Harbour (EIA of PA 3152/05)

3.1.1.4 Repair and extension of Marsaxlokk coastal defences

The EIA and AA studies conducted in relation to the repair and extension of coastal defences at Marsaxlokk (PA 4576/09) provide a benthic habitat map (reproduced below as Figure 11) for the inner reaches of Marsaxlokk Bay, in close vicinity to the infralittoral area identified for land reclamation purposes at the gas terminal facility.

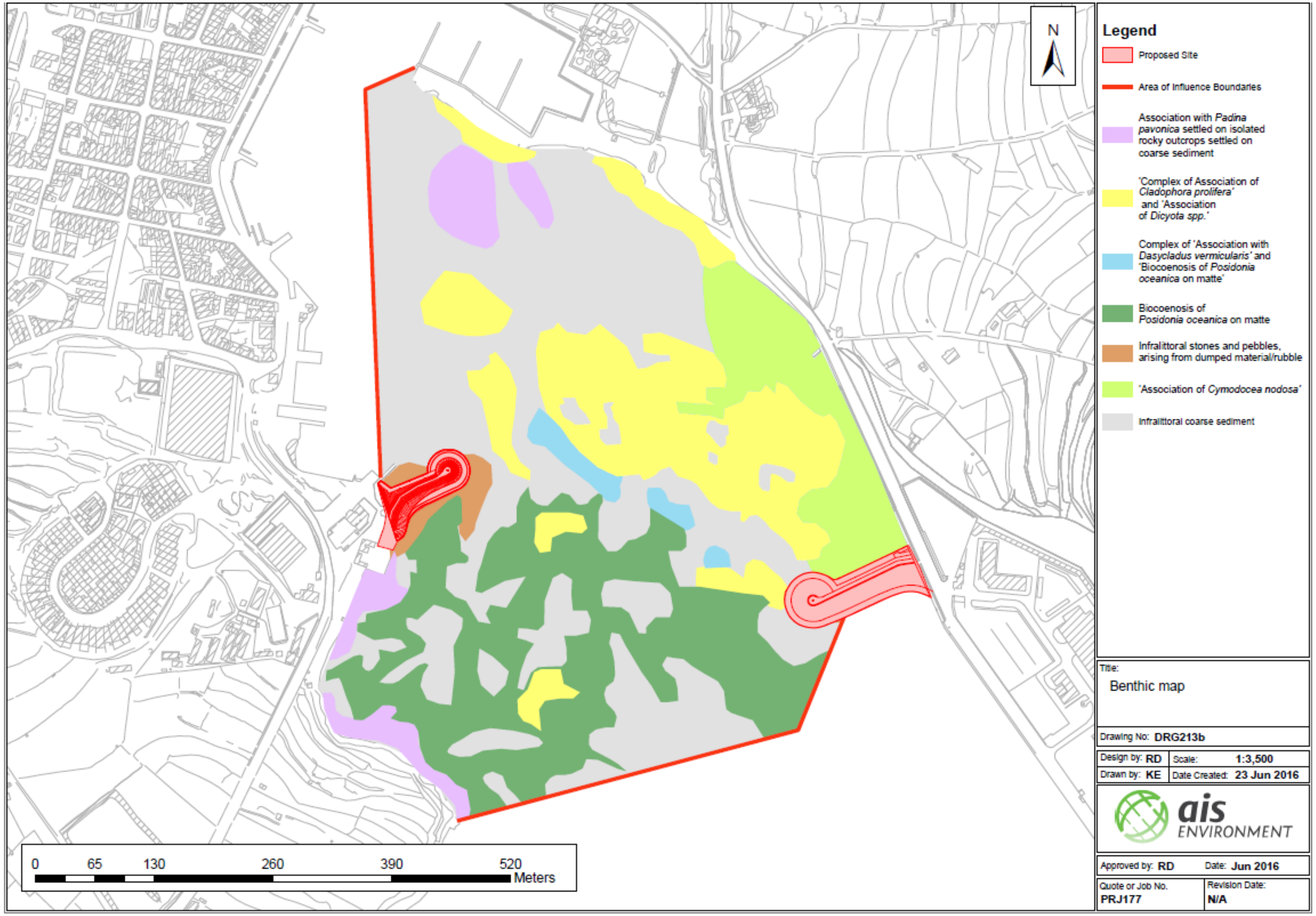


Figure 11: Benthic habitat map for Marsaxlokk Harbour swathes (EIA of PA 4576/09)

3.1.1.5 EMODNET Seabed Habitats Portal

Benthic habitat data for the Maltese coastal/nearshore locations in close proximity of the landing site was gleaned through this portal,[3] which was specifically queried for such data in November 2019. The distribution of benthic habitats, classified as per EUNIS criteria, as extracted from this portal is reproduced in Figure 12.

[3] https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/

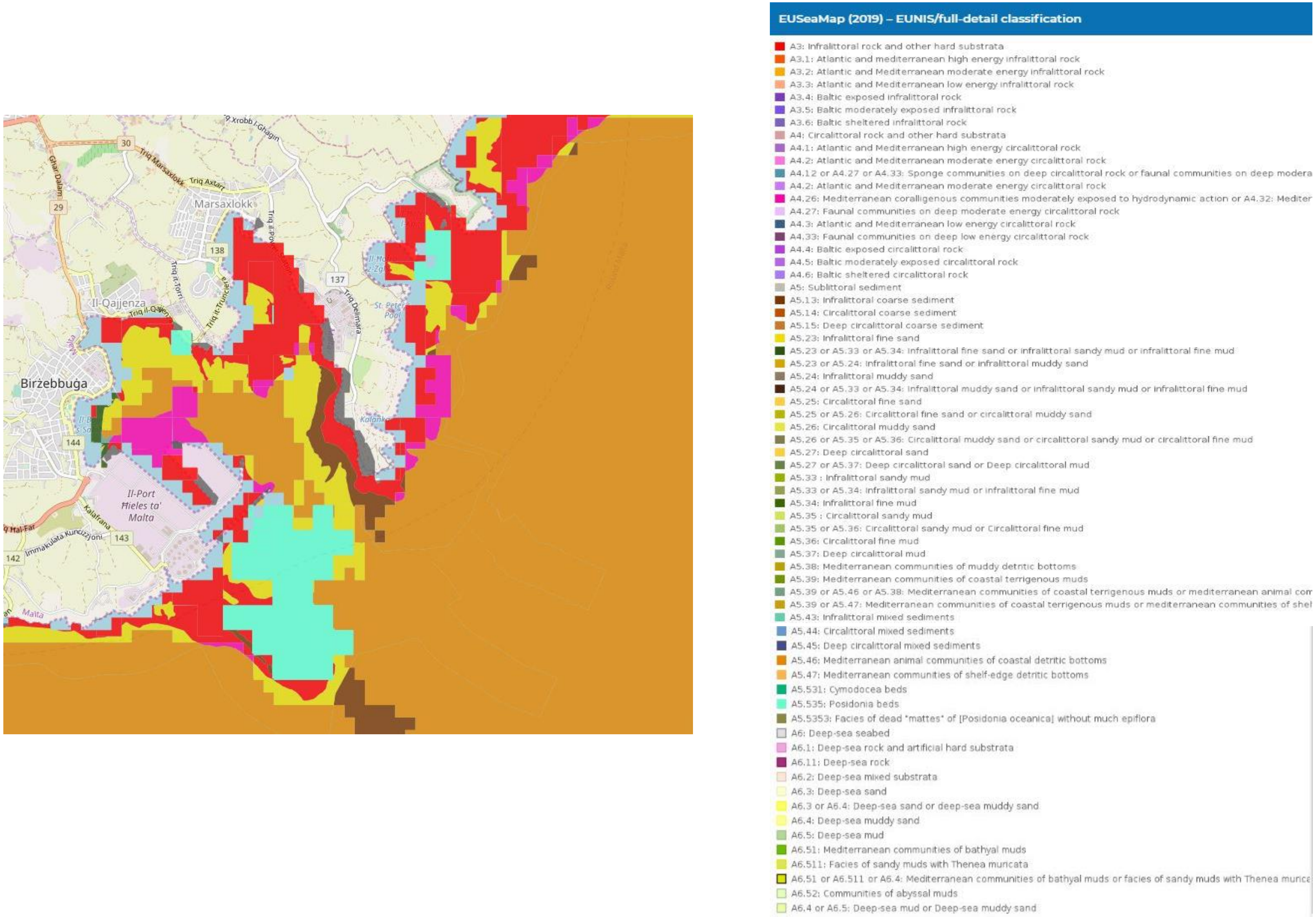


Figure 12: Benthic habitats in the Marsaxlokk area (EMODNET portal)

One observes that the coastal area identified for land reclamation purposes in connection with the development of the gas terminal facility, is characterised by the following benthic assemblages (ranked in terms of distance from the shoreline, with the assemblage listed first being the closest to the shore):

- A5.24 – infralittoral muddy sand
- A3 – infralittoral rock and other hard substrata
- A5.13 – infralittoral coarse sediment
- A5.23 – infralittoral fine sand

The eastern flank of the Delimara peninsula, which will support limited trenching activities at the emersion site prior to the complete sub-bottom burial of the pipeline through micro-tunnelling, is characterised by the following benthic assemblages (ranked once again in terms of distance from the shore):

- A5.43 – infralittoral mixed sediments
- A3 – infralittoral rock and other hard substrata
- A4.26 – Mediterranean coralligenous communities moderately exposed to hydrodynamic action
- A3.2 – Atlantic and Mediterranean moderate energy infralittoral rock

3.1.1.6 P. oceanica *distribution from LIDAR*

Borg et al. (2009) mapping of *P. oceanica* distribution in Maltese waters through LIDAR technology. This study describes the wider Delimara area as supporting scattered *P. oceanica* meadows, with the relevant distribution map reproduced as Figure 13.

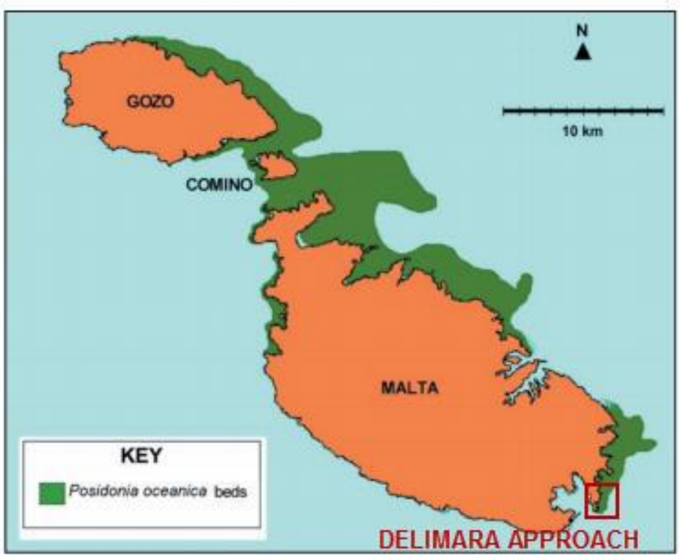


Figure 13: P. oceanica *distribution in Malta (Borg et al., 2009)*

3.1.1.7 Seabed habitat mapping

Maltese national seabed habitat mapping exercise conducted within the ambit of the MSFD's Initial Assessment (ERA, 2016). Distribution maps for (a) sublittoral sediment and biogenic reefs and (b) maerl, sand and gravel-based assemblages have been extracted and these are reproduced below as Figure 14.

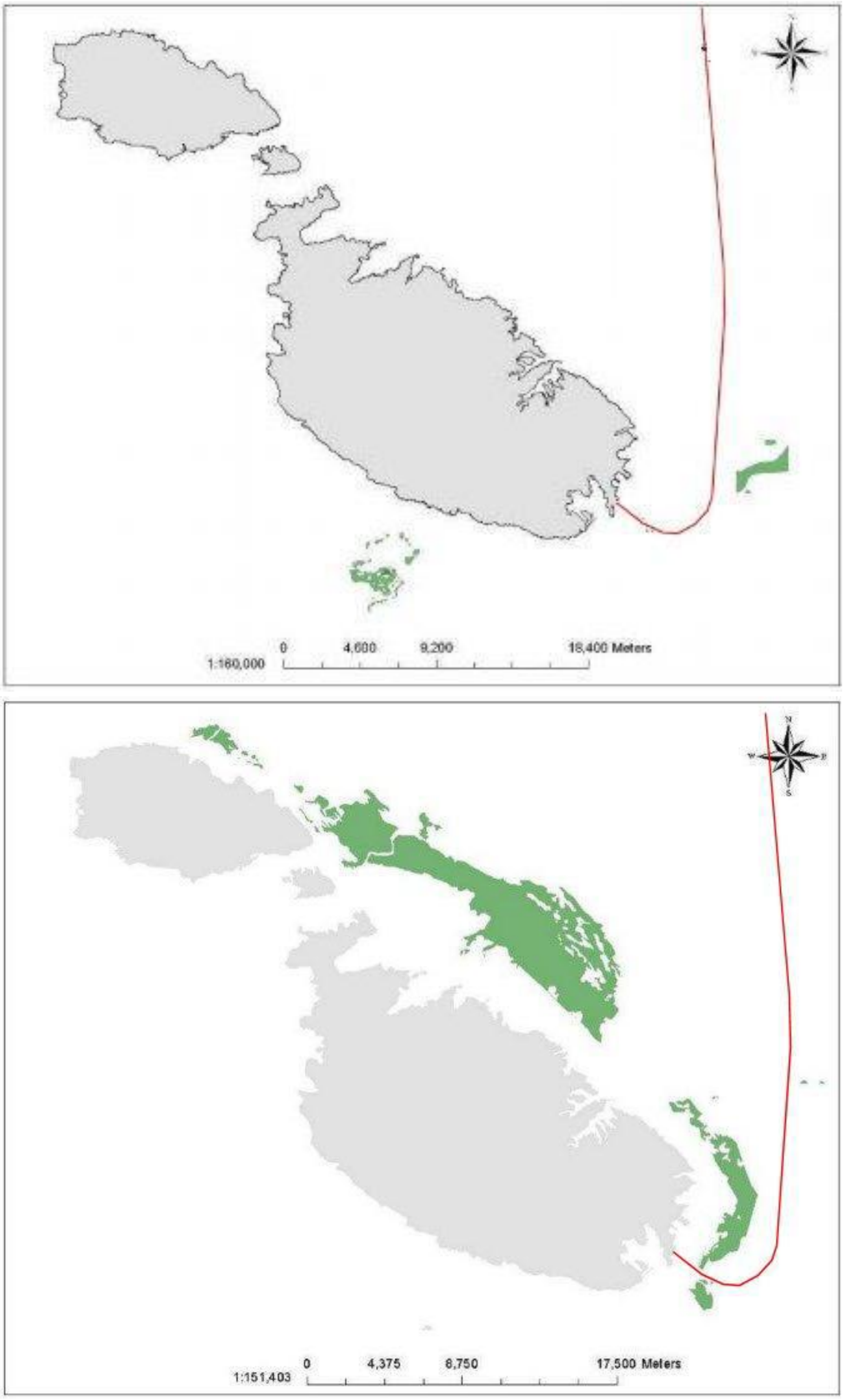


Figure 14: Distribution maps for biogenic reefs (top) and maerl/sand/gravel assemblages (bottom)

3.1.1.8 SE Aquaculture zone monitoring

Marine ecological monitoring of the South Aquaculture Zone (Aquabiotech, 2013). Aquabiotech was commissioned to conduct a marine ecology monitoring exercise, through benthic grab sampling, in 2013, adopting the same sampling scheme adopted during the previous 3 monitoring seasons on site as devised by Ecoserv. The distribution of the various sampling stations is given in Figure 15 below.

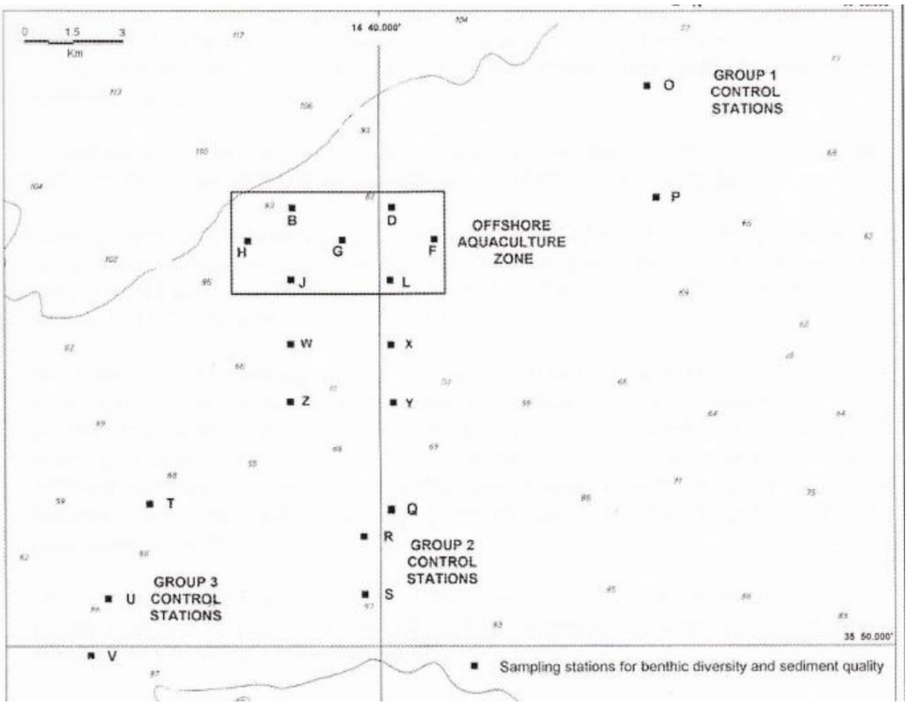


Figure 15: Benthic grab stations for monitoring of SE Aquaculture Zone

Given their proximity to the proposed gas pipeline itinerary/route (and thus its relevance for the current study), as indicated in Figure 16, the benthic sediment typology as assessed through grab sampling for sampling stations B, H, T, U and V is being reproduced. Details are included in Table 1.

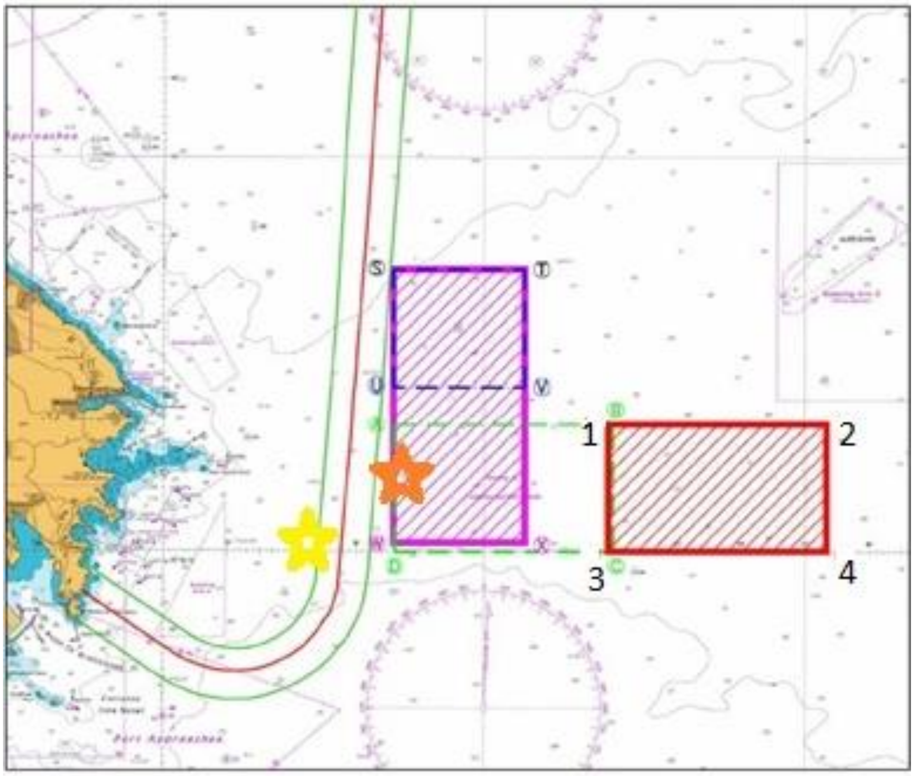


Figure 16: Benthic stations and pipeline route (yellow star = T, U & V; orange star = B & H)

Table 1: Benthic sediment typology for sampling stations

Grab station (Figure 16)	Location	Location relevant to pipeline	Broad description of benthic sediment typology as reported in Aquabiotech (2013)
B (orange star)	Within current SE Aquaculture Zone	2000m from outer margin of pipeline corridor	Very coarse sand with rhodoliths
H (orange star)	Within current SE Aquaculture Zone	600m from outer margin of pipeline corridor	Very coarse sand with sparse rhodoliths – one replicate was composed solely of *Mytilus galloprovincialis* and *Pinctada radiata* individuals
T (yellow star)	Located to the south-west of the current SE Aquaculture Zone	200m from actual gas pipeline	Muddy sediment devoid of rhodoliths
U (yellow star)	Located to the south-west of the current SE Aquaculture Zone	500m from actual gas pipeline	Very coarse sand with rhodoliths
V (yellow star)	Located to the south-west of the current SE Aquaculture Zone	600m from actual gas pipeline	Very coarse sand with sparse rhodoliths and coralline algae

3.1.1.9 P. oceanica *distribution from SSS Dataset 2003*

A *Posidonia oceanica* distribution map (reported below as Figure 17) as gleaned from the MAP INFO SSS Dataset 2003 reveals the occurrence of extensive such meadows just outside the mouth of Marsaxlokk Bay and the breakwater to the same embayment.

Figure 17: P. oceanica *distribution from SSS study*

Through SCUBA dives conducted just offshore the current Delimara power station site, as part of the AA and EIA studies for PA 3152/05 revealed that the small, incipient pocket of *P. oceanica* previously recorded in close propinquity to the site identified for land reclamation purposes (and demarcated by a red circle in Figure 17) had been severely degraded or even obliterated through heightened levels of siltation (possibly through dredging activities) in the area, as observed within Figure 18. This is also confirmed through the seabed habitat data reproduced from the EMODNET portal through Figure 12.

Figure 18: Degraded P. oceanica *(EIA for PA 3152/05)*

Consequently, the closest *P. oceanica* meadows are approximately located at the following distances from the coastal site earmarked for land reclamation:

- 450m to the North-West
- 950m to the South-West

3.1.2 Surveys undertaken by PMRS contractor

From the 11 swathes lying along the proposed gas pipeline route which have been subjected to further investigation through the collection of geophysical data, seabed samples and ROV footage, only 8 (numbered 4-11) were considered for this assessment given that they extend over Maltese FMZ and territorial waters. The following combined, integrated methodology was deployed for the investigation of sensitive benthic biotic assemblages along the pre-selected 11 swathes:

- geological, geophysical and geotechnical methods together with visual inspection surveys were used;
- bathymetric, morphologic and stratigraphic data have been acquired through the analysis and interpretation of data collected by means of MBES, SSS, SBP and Magnetometer;
- geotechnical samples were collected (piston cores and boreholes) and cone penetration tests were carried out together with box corer samples collected during the environmental survey phase;
- visual inspections have been carried out by means of ROV to characterize marine habitats and archaeological constraint and to ground-truth the geophysical survey results at Client defined positions;
- ROV transects have been performed also in spotted locations along the offshore pipeline section mainly where sonar contacts have been interpreted from the geophysical data (MBES/SSS/SBP), in order to verify the sonar targets, to confirm the geophysical interpretation and to detail the seabed characterisation;
- ROV inspection has been also performed at Client defined locations in the offshore section of the pipeline route.

The results of these localised visual investigations have been extended, wherever possible, to nearby geophysical interpreted areas, in particular where the SSS acoustic response and water depths were similar to the sections investigated with ROV.

The contractor focused on the following benthic biotic assemblages classified as being ‘sensitive’ and thus of high conservation importance:

- *Posidonia oceanica* beds;
- *Cymodocea nodosa* beds;
- Biogenic reefs;
- Maerl beds.

The attributes of the 8 swathes taken under consideration are summarised in Table 2 below.

Table 2: Attributes of the 8 benthic swathes (KP 0 commences from Gela shoreline)

ID#	FROM KP – TO KP along the design route	WATER DEPTH RANGE	DESCRIPTION
4	KP129.5 - KP134.	126m - 112m	Biogenic concretions/Bioconstructions (coralligenous)
5	KP137.8 - KP138.7	75m - 83m	Maërl beds and coralligenous biocenoses at the moderate to steep flanks of the northern subcropping area
6	KP139 – KP149.8	96m – 50m	Biogenic concretions/Bioconstructions (coralligenous) at the pinnacles outcrops; possible same interpretation of the subcropping and hardground areas in deeper w.d. not covered by ROV
7	KP149 – KP149.3	70m – 60m	Fine to Coarse SAND occasionally colonised by sparse growths of photophilic algae
8	KP149.5 - KP150.12	57m – 42m	Fine to Coarse SAND occasionally colonised by sparse growths of photophilic algae
9	KP150.156 - KP150.24	46m – 40m	Scattered vegetation (mainly on sand, covering subcropping rock) constituted by *Posidonia oceanica* and photophilic algae
10	KP150.50 – KP 150.54	28-30m roughly 190m SW of the route	Scattered *Cymodocea nodosa* on sand (N.B.: isolated patch, detected only on one ROV line)
11	KP150.24 – KP150.60	40m – 7m	Dense Posidonia oceanica meadows mainly settled on rock, in association with brown and green algae

The geographic location of each of the ROV transects conducted within the selected 8 benthic biotic investigation swathes (coastal and offshore) is given in Figure 19 and described in Table 3. Figure 20 to Figure 25 convey the bathymetric profile and SSS mosaics for staggered stretches of the surveyed seabed enclosed within the Maltese FMZ.

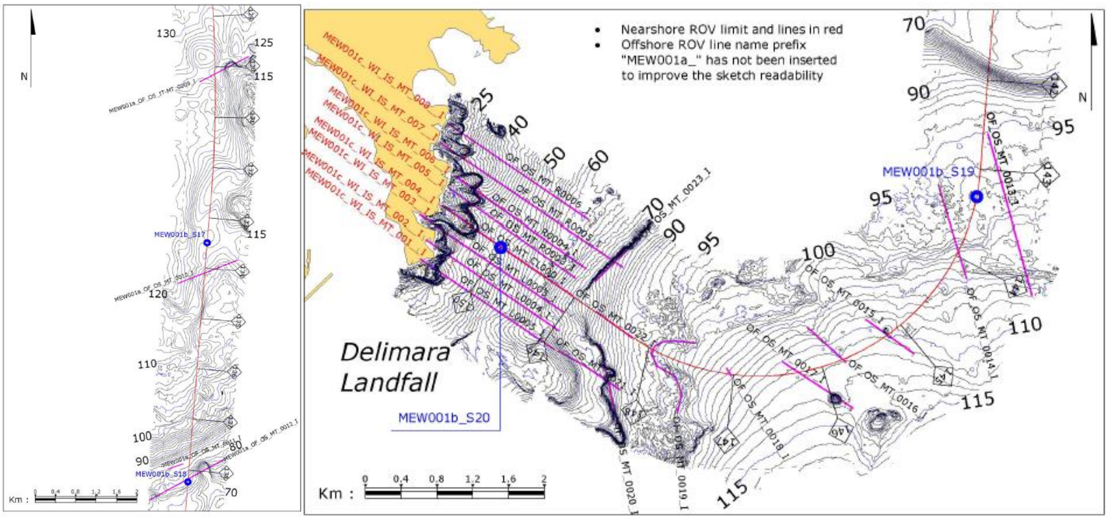
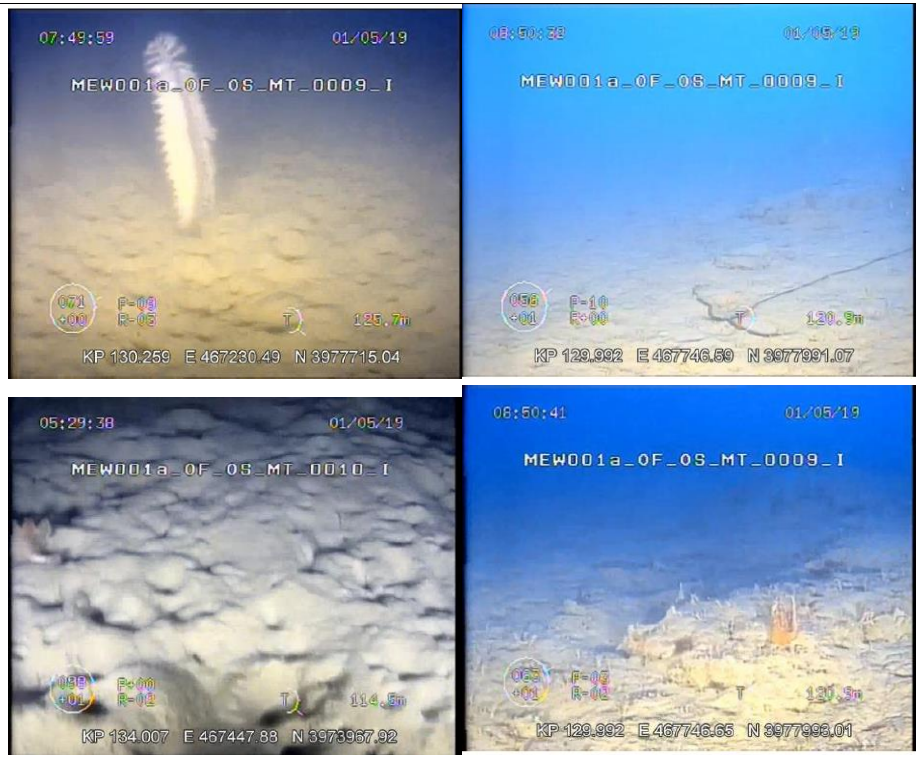


Figure 19: ROV transects conducted in the Maltese FMZ

Table 3: Description of the recorded benthic assemblages

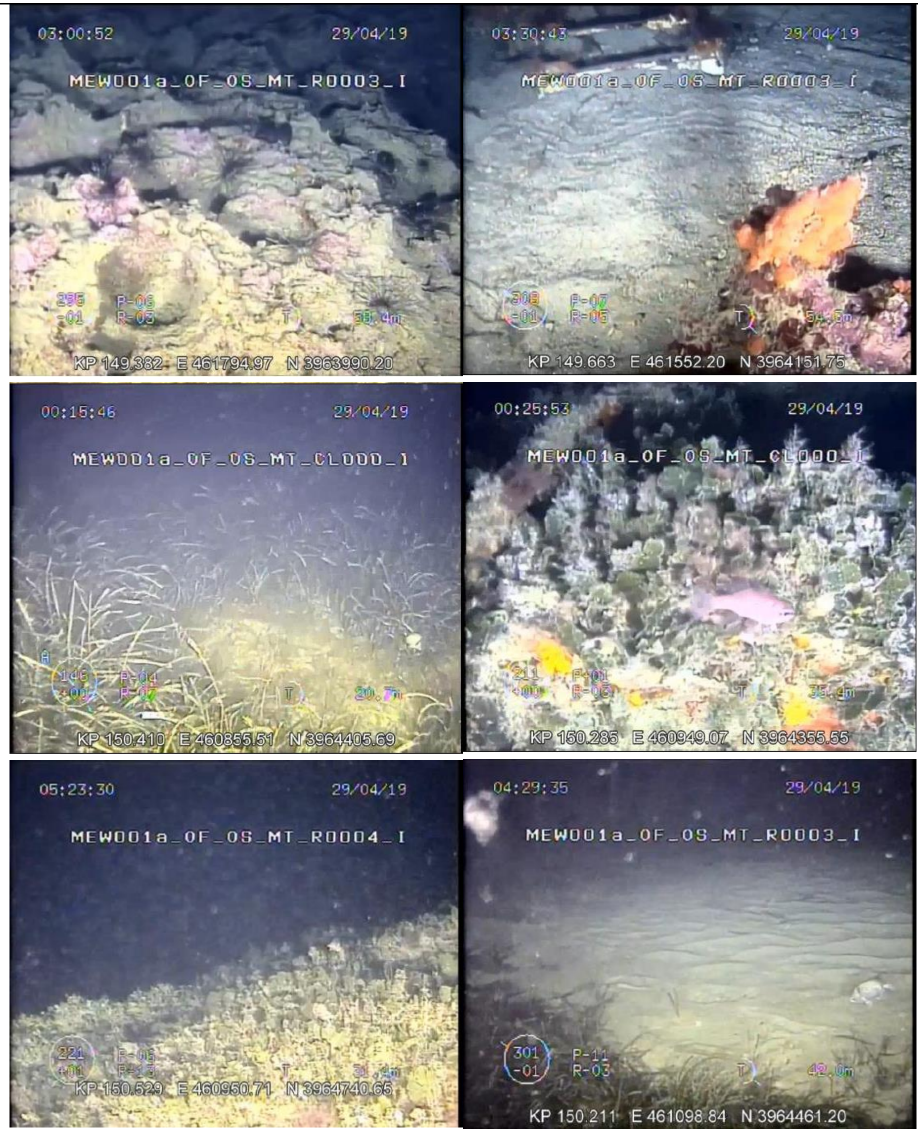
Location	Depth/m	Description	Voucher photos
KP129.5-KP134	110-128	Two ROV transects have been acquired, respectively at about KP130.2 (117-128m depth) and at KP134.1 (110-120m), crossing fine sediments, sub-cropping and outcropping areas: the fine sediment domain (soft silty sand) was characterised by extensive bioturbation, such as burrows. This circalittoral biocoenosis featured sparse aggregations of bivalves, with typical low biodiversity values. In the sandy seafloor, a number of sparse Pennatulacea individuals and abundant *Bonellia viridis* individuals were recorded. Demersal fish species observed in the footage included *Zeus faber* and *Triglidae taxum.* Rocky outcrops encountered within this area were colonised by species characteristic of coralligenous assemblages, including bryozoans, sponges (e.g. *Axinella polypoides*) and gorgonians (e.g. *Eunicella cavolinii*).	

Location	Depth/m	Description	Voucher photos
			
KP136-141.75	69-83	Maerl beds were recorded at depths ranging between 75 and 83m. These were interspersed with fine sediment silty fine sand) which in turn supported isolated sub-cropping areas detected by SSS/SBP at the high's tops. At the moderate and steepest flanks of the northern sub-cropping area, the coralligenous biocoenosis has also been recorded. Within the later biocoenosis, the echinoid *Cidaris cidaris* was commonly encountered, along with Sparidae species such as *Dentex dentex* and *Diplodus vulgaris.* Unidentified sponge and octacoral species were also common within this biocoenosis.	   

Location	Depth/m	Description	Voucher photos
			
KP143-KP149	70-115	This stretch is characterised by a highly complex and heterogeneous seabed, which poses a number of routing challenges as a result of its roughness. For instance, numerous pinnacles and mounds have been recorded, along with an E-W tilt. The pinnacle outcrops have been mainly recorded West of route from approx. KP143.1 to KP144.3 and South of the route from KP145 to KP146. They are the dominant benthic feature within the following stretch: KP147.3 to KP148.3. Their average height is that of 2m and they are abundant in water depths ranging from 90m to 105m. ROV transects have been acquired at the following KP locations: East of the route approximately from about KP142.5 to KP144 and at about KP144; at about KP145.2, KP145.75, KP146.3; between KP147.5 and KP148 and South of KP148.5. ROV analyses	   

Location	Depth/m	Description	Voucher photos
		confirmed the rocky nature of the outcrops ascribable to coralligenous biocenoses. From KP145 TO KP146.5 (water depths ranging between 100m and 115m), the ROV transects highlight the dominance of a sandy seafloor with abundant burrows and bioturbations, broken by isolated outcrops. Associated with the outcrops, one could observe numerous *Bonellia viridis* individuals, as well as unidentified echinoid individuals and single individuals of *Palinurus elephas* and *Cerianthus membranaceus*. Pelagic and demersal species recorded included *Sepia officinalis* and *Symphodus tinca*. Between KP147.5 and KP148, the water depth ranges from about 101m to 92m and the recorded outcrops and rocky pinnacles areas are supported coralligenous assemblages which in turn were characterised by numerous bryozoan, polychaete, sponge and scleractinian coral species. An arborescent colony of *Antipathes dichotoma* was also recorded. Echinoderm species were represented on site by *Cidaris cidaris* and *Ophidiaster ophidianus*, whilst *Bonellia viridis* was once again highly frequent. A number of to Rajidae individuals [probably, *Raja clavata),* as well as *Loligo vulgaris* and Triglidae species were also	     

Location	Depth/m	Description	Voucher photos
		observed amongst the pelagic and demersal species. From about KP148 to KP149, two ROV transects have been acquired, characterised by moderate to steep slopes supporting coralligenous outcrops and water depths ranging from 70m to 80m. The biodiversity assets are similar to the KP147.5 – KP148 section with the exception of the green alga [probable *Flabellia petiolata.* Echinoid and species were represented by *Cidaris cidaris* and *Centrostephanus longispinus* whilst occasional *Axinella polypoides* individuals were encountered. Recorded fish species included individuals of *Diplodus vulgaris* and of Triglidae species. One more ROV transect has been acquired along the route approximately from KP148.2 and KP148.7, with the main aim to check the origin of six recorded magnetic contacts. The footage revealed the presence of *Cidaris cidaris, Loligo vulgaris,* Paguridae and Malacostraca.	 

Location	Depth/m	Description	Voucher photos
KP 149-150.836 (nearshore)	7.5-70.2	The closest distance from the shore that the 8 parallel nearshore ROV transects reached was that of 25m, reaching a maximum water depth of 85m. Two prominent bathy-morphological structures were recorded within this area: - from KP149.408 to KP149.442, an NNE-SSW trending, sparsely-rocky area mainly detected North of the route, with rock outcrops rising 3-4m from the surrounding seabed at slopes of up to 20°. This rocky reef consisted of a calcareous reef colonised mainly by different anthozoan and sponge species; - upon approaching the coast, an irregularly-shaped escarpment representing the offshore extension of the coastal cliff, consisting of Globigerina Limestone and featuring gradients of up to 70° has been recorded. The rocky outcrops characterising the more nearshore swathes of the Maltese landfall are colonised by dense meadows of seagrass (mainly *Posidonia oceanica* meadows), which become progressively sparser in the transition to the deeper sub-cropping areas.	

Location	Depth/m	Description	Voucher photos
		Four main benthic assemblages have been identified within this sector: (i) Fine to coarse sand (MEW001b_S20: shell fragments and corals with organic matter within a coarse SAND matrix; MEW001b_K59: very soft sand); approximately from KP149 to KP149.3 and from KP149.5 to KP150.12, sand is occasionally colonised by sparse growths of sciaphilic algae (namely, *Flabellia petiolata*). The Mediterranean cardinalfish *Apogon imberbis* was frequently encountered within this assemblage. (ii) Seagrass mainly settled on bedrock (biocoenosis of *Posidonia oceanica* meadows in association with other photophilic plants and algal species): dense meadows; (iii) Sparse vegetation (mainly on sand, settled on sub-cropping rock) consisting of reticulate *Posidonia oceanica* meadows and facies photophilic algae; (iv) Coralligenous / biogenic reef	 MEW001c_WI_IS_MT_001__I  MEW001a_OF_OS_MT_R0003_I  MEW001c_WI_IS_MT_003__I  MEW001c_WI_IS_MT_007__I  

Location	Depth/m	Description	Voucher photos
		The recorded *P. oceanica* meadows were settled mainly on rock, but also on patches of sandy seafloor covering the rocky outcrops. At the deepest end of the *P. oceanica*-based assemblage, the seagrass became sparser, becoming progressively replaced by the sciaphilic green alga *Flabellia petiolata.* The sandy seafloor intervals were etched by bedforms (ripples and megaripples), with the consequent accumulation of biogenic debris and vegetation residues. MEW001a_OF_OS_MT_R0004_I is the seaward extension of another inshore transect (MEW001c_WI_IS_MT_006__I), along which the lower limit for *Posidonia oceanica* was recorded at a depth of 30m. Closer to shore and in shallower waters, a biocoenosis of *P. oceanica* interspersed with the photophilic brown alga species *Dictyopteris polypodioides* was recorded. Sparse *Cymodocea nodosa* meadows settled on sand at water depths of about 28-30m were only at the start of the ROV line MEW001c_WI_IS_MT_003__I. Within this same assemblage, monospecific stands of *Cystoseira*, possibly of *C. brachycarpa*, were recorded at water depths less than 10m.	

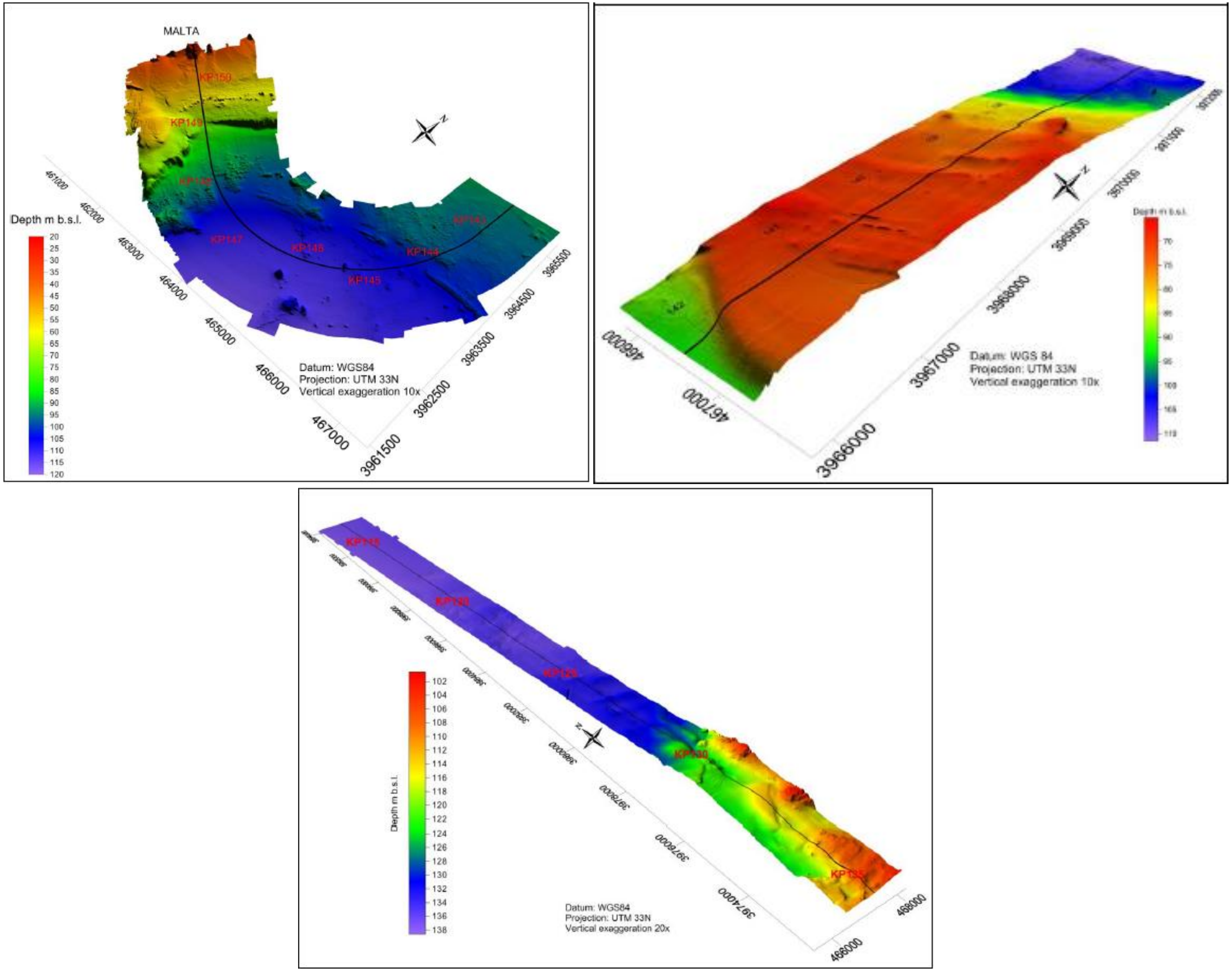


Figure 20: Bathymetric profile of the seabed (top left: KP142-Malta landfall; top right: KP135-KP142; bottom KP113-KP135)

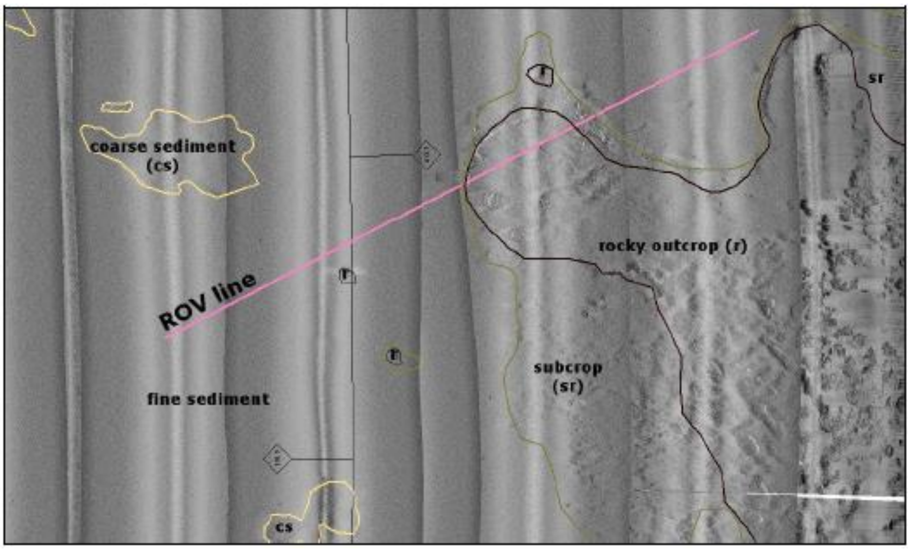


Figure 21: SSS mosaic at KP130-KP130.5

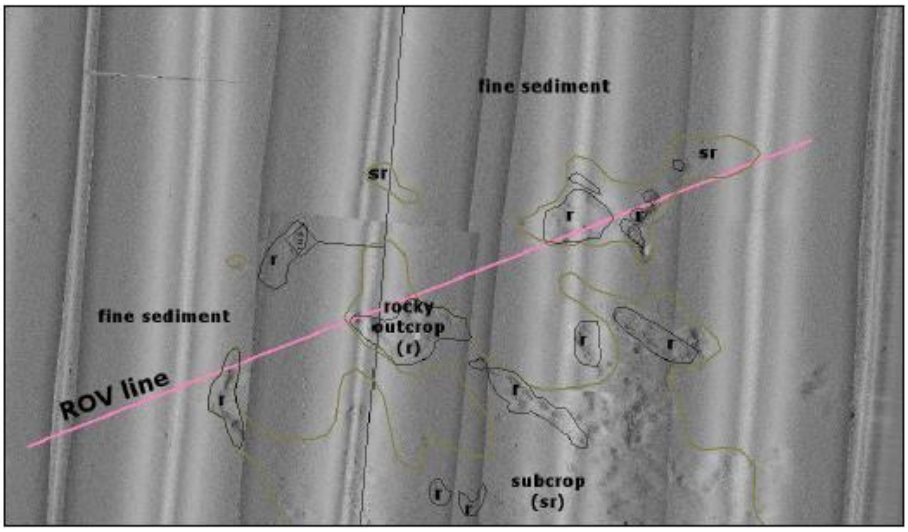


Figure 22: SSS mosaic at about KP134.3

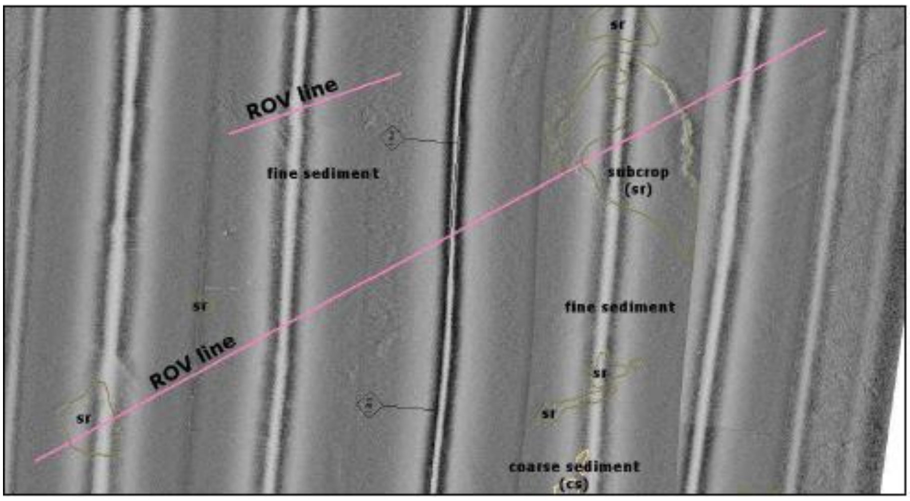


Figure 23: SSS mosaic at KP137.5-KP138.7

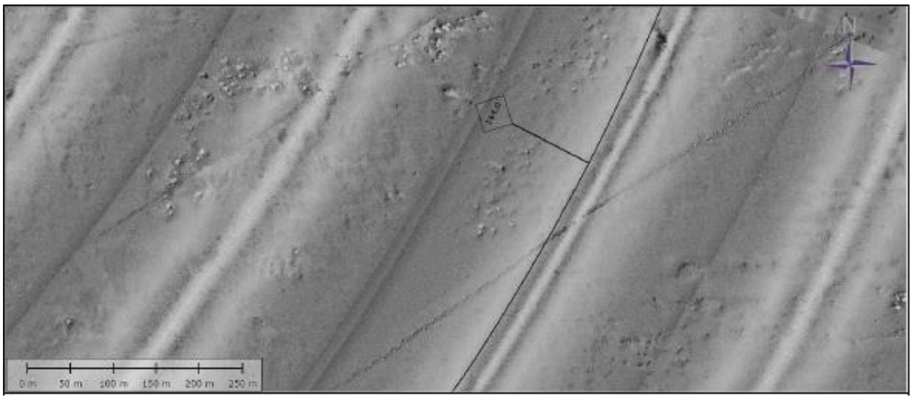


Figure 24: SSS mosaic at KP144 showing rocky pinnacles and scars

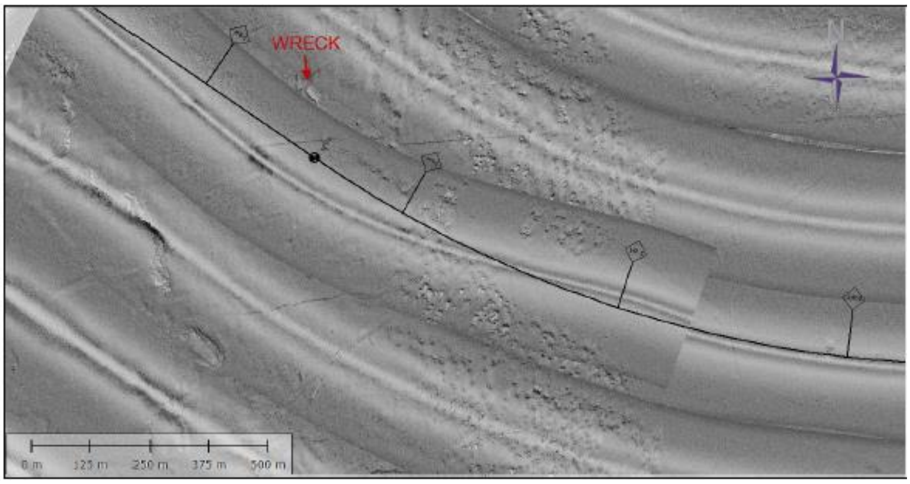


Figure 25: SSS mosaic at KP148 showing rocky pinnacles, scars and wreck

For the Maltese coastal areas (up to KP 142), a detailed *Posidonia oceanica* distribution habitat map as well as distribution maps for other sensitive benthic habitats were plotted by the PMRS contractor through the integration of both geophysical and ROV data, as reproduced in Figure 26. For the more offshore areas (up to KP 108), only maps for bathymetry, seabed topography and geodetic parameters have been produced, as shown in Figure 27.

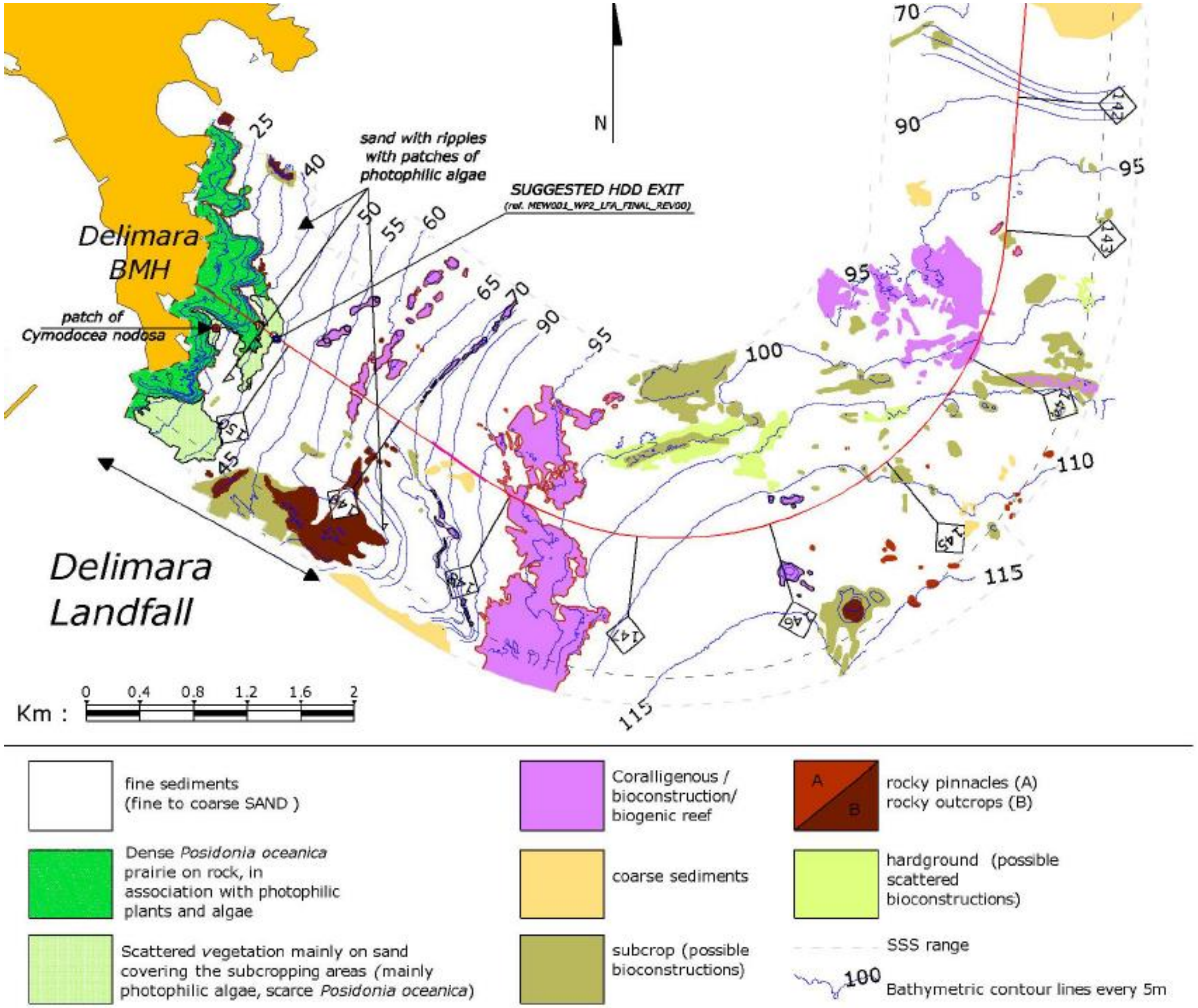


Figure 26: Benthic habitat map for the Maltese coastal areas

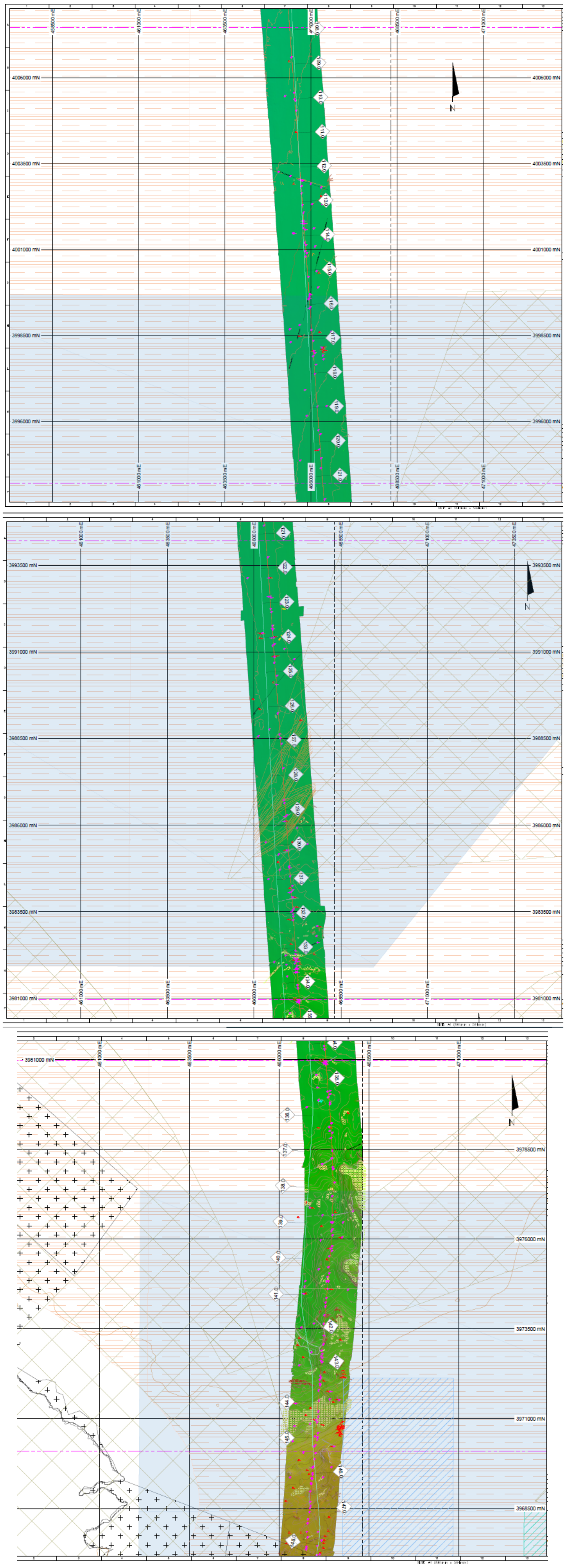


Figure 27: Bathymetric, seabed topography and geodetic map for offshore areas

3.1.3 Biotic characterisation considerations AoI

Evidence of existing anthropogenic disturbance were recorded within the surveyed swathes, such as those shown in Figure 28 and Figure 29.

Figure 28: Discarded fishing line at KP 150.077 (depth of 44.5m)

Figure 29: Long-standing discarded fishing net at KP 145.2 to KP 146.3

The full list of protected benthic species is given in Table 4. Where maerl or coralline algal aggregations were recorded within the AoI, these were ascribed to the following 2 species only: *Lithothamnion minervae* and *Lithothamnion corallioides,* given that these represent the main rhodolith-forming species in the Maltese Islands (Lanfranco et al., 1999).

Table 4: Full list of protected benthic species

Species	S.L. 549.44	Habitats Directive	SAP-BIO Protocol	Bern Convention
Cystoseira cfr. *brachycarpa*	Schedule III (but as *Cystoseira* spp.)	Not listed	Not listed	Not listed
Posidonia oceanica	Not listed	Not listed	Annex II	Appendix I
Cymodocea nodosa	Schedules III and VIII	Not listed	Not listed	Appendix I
Lithothamnion minervae and *Lithothamnion corallioides*	Schedule III	Annex V (*L. corallioides*)	Not listed	Not listed
Ophidiaster ophidianus	Schedule VI	Not listed	Annex II	Appendix II
Centrostephanus longispinus	Schedule V	Annex IV	Annex II	Appendix II
Palinurus elephas	Schedule VIII	Not listed	Annex III	Not listed
Eunicella singularis	Not listed	Not listed	Not listed	Not listed
Antipathes subpinnata	Schedule VI	Not listed	Annex III	Appendix III (as *Antipathes* spp.)
Axinella polypoides	Schedule VI	Not listed	Annex II	Not listed
*Pinna nobilis**	Schedule V	Annex IV	Annex II	Appendix II
P. oceanica meadows	Schedule I	Annex I – priority habitat	Not listed	Not listed
Reefs (recorded as biogenic reefs)	Schedule I	Annex I	Not listed	Not listed

**Pinna nobilis* was not directly recorded during the current study. However, the species is known to occur in nearshore waters within the surveyed area and is thus being included within this assessment as a precautionary measure.

Key:

S.L. 549.44:

- Schedule I = Natural habitat types whose conservation requires the designation of Special Areas of Conservation (SACs)
- Schedule III = Animal and plant species of national interest whose protection requires the designation of Special Areas of Conservation (SACs)
- Schedule VI = Animal and plant species of national interest in need of strict protection
- Schedule VIII = Animal and plant species of national interest whose taking in the wild and exploitation may be subject to management measures

Habitats Directive

- Annex I = Natural habitat types of community interest whose conservation requires the designation of Special Areas of Conservation (SACs)

- Annex IV = Animal and plant species of community importance in need of strict importance
- Annex V = Animal and plant species of community interest whose taking in the wild and exploitation may be subject to management measures

SAP-BIO Protocol

- Annex II = List of endangered or threatened species
- Annex III = List of species whose exploitation is regulated

Bern Convention

- Appendix II = Strictly protected fauna species
- Appendix III = Protected faunal species

The benthic communities of highest conservation importance located in closest propinquity to the proposed gas pipeline route which might potentially be impacted by the development are summarised in Figure 30 below. The short-listing of these assemblages is justified in Table 5.

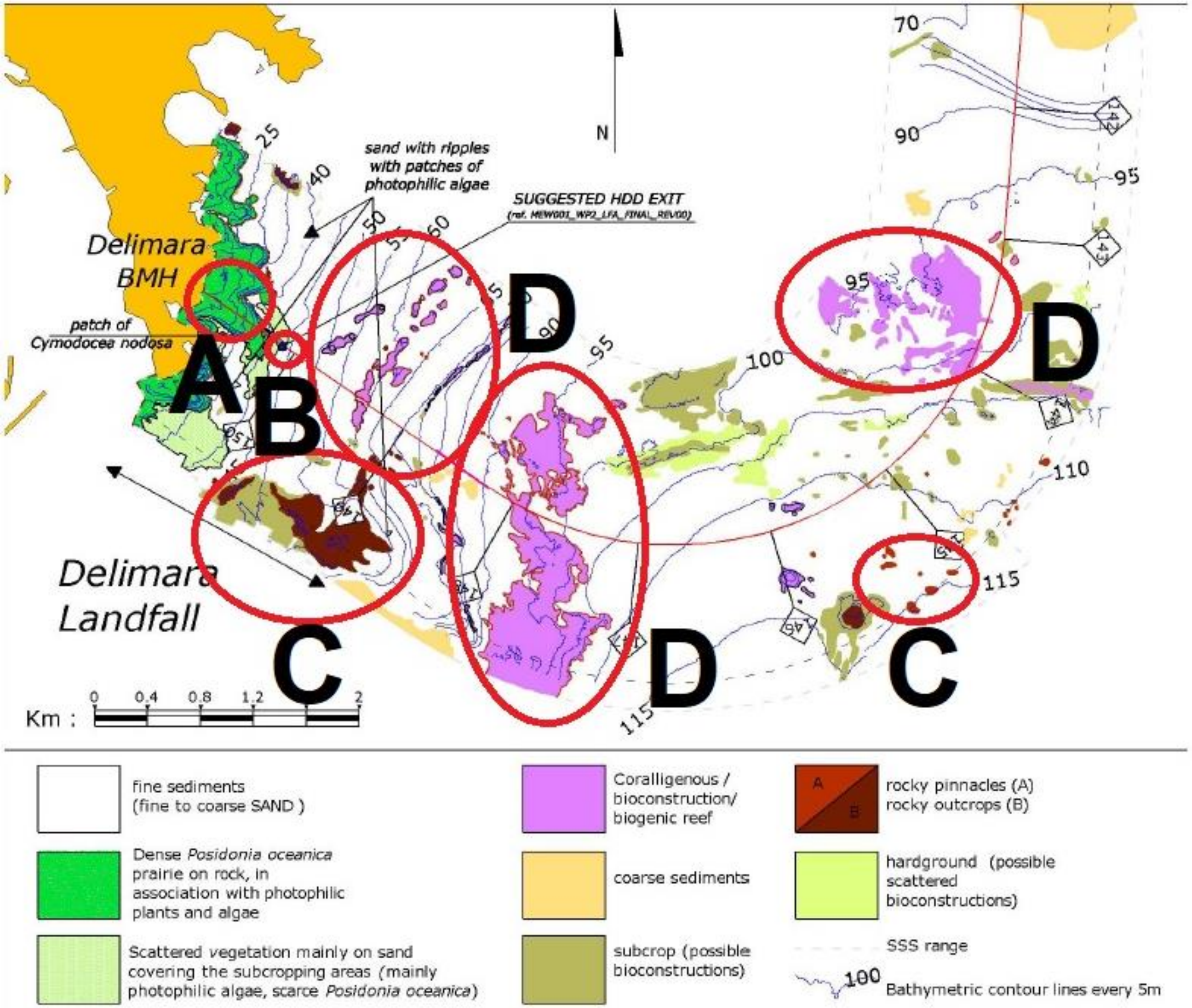


Figure 30: Benthic communities of highest conservation importance

Table 5: Justification for the selection of benthic assemblages in Figure 30

Benthic assemblage in Figure 30	Justification for the selection of the same benthic assemblages as ones of high conservation importance
A	Seagrass (*P. oceanica* and *C. nodosa*) meadows are listed as benthic habitats of high conservation importance which are notoriously sensitive to sediment budget changes
B	Escarpment area characterised by pronounced gradient figures as high as 70 degrees (Figure 31) and thus of high conservation value (through its potential to support gorgonian species and dense coralligenous assemblages) which will host the transition pit and landfall of pipeline within micro-tunnelling borehole
C	Dense aggregation of rocky pinnacles since this seabed typology has the potential to support benthic species of high conservation importance, including *Corallium rubrum* and *Eunicella cavolinii* (e.g. Cattaneo-Vietti et al., 2017).
D	Biogenic reef/bioconstruction area which could support living rhodolith-rich areas. Such areas are renowned, in turn, for the high biodiversity they support (e.g. Barbera et al., 2003).

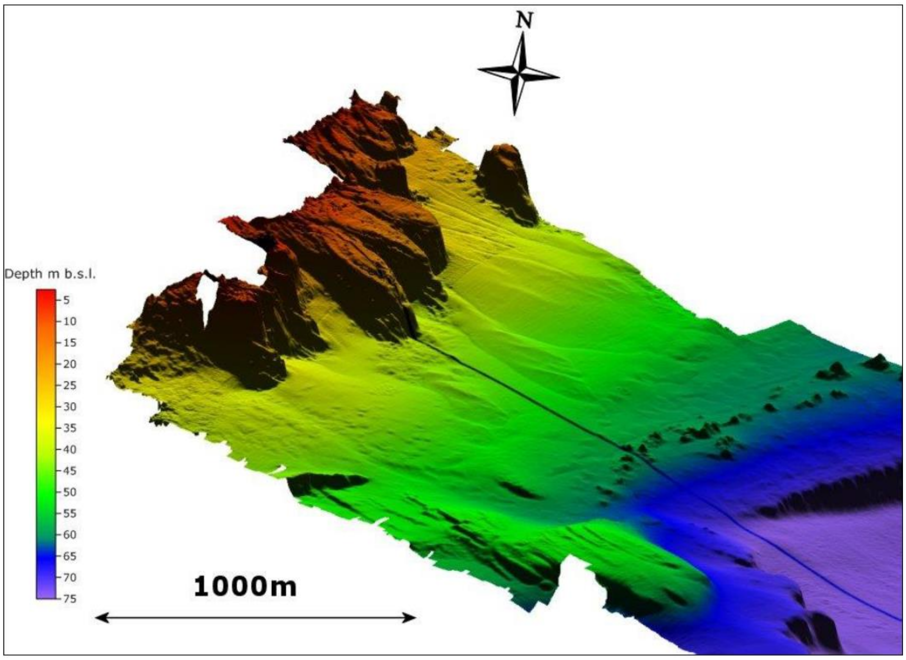


Figure 31: Region B, characterised by an escarpment and pronounced gradient values

Along the route (MEW001a_OF_OS_MT_CL000_I), *Posidonia oceanica* was detected down to a depth of about 40-45m. Such a deep lower limit for *P. oceanica* meadows is indicative of a high degree of water transparency and of generally a very good health status for the same meadows.

3.2 Avian study

3.2.1 Evaluation of the legal protection and conservation status of the ecological resources

The conservation status of birds has been assigned in accordance to the Species of European Conservation Concern (SPEC) system (Birdlife International, 2017), IUCN Red List (Category Europe) and the Birds Directive.

3.2.1.1 Protected sites and species

The peninsula across which the underground pipeline will be constructed is Scheduled as an Area of Ecological Importance (AEI) and forms part of the *Rdum mid-Daħla ta' San Tumas sa is-Sarc* AEI which was established via Government Notice 400 of 1996 with the specific aim of protecting the overall integrity of the rural surroundings against development pressures. The underwater part of the pipeline will also pass through three Marine Protected Areas namely *Żona fil-Baħar fil-Grigal* (MT 0000107), *Żona fil-Baħar fil-Lvant* (MT 0000108) and *Żona fil-Baħar fil-Lbiċ* (MT 0000111) all of which are designated as SPAs.

The closest bird sanctuary is that of *Il-Ballut ta' Marsaxlokk* which is about 1.5 km away from the Terminal Plant.

3.2.1.2 Żona fil-Baħar fil-Lbiċ

The *Żona fil-Baħar fil-Lbiċ* is a large area of sea beyond the cliffs stretching along all the south west coast of the Maltese islands and beyond the islet of *Filfla* to the area known as *Għar Bella* close to the area where the gas pipeline reaches the Maltese shores (Figure 32). The site was identified in the Maltese Marine IBA inventory as a result of the EU LIFE+ Malta Seabird Project (LIFE10 NAT/MT090) due to its importance for *Calonectris diomedia, Hydrobates pelagicus* and *Puffinus yelkouan.*

The site is designated as a Special Protection Area via Government Notice 1311 of 2016, as declared through the provisions of the Flora, Fauna and Natural Habitats Regulations of 2016 [S.L. 549.44].

As outlined in the ERA N2K datasheets[4], the Storm Petrel (*Hydrobates pelagicus)* which has a strong colony on *Filfla* is deemed to have a population of between 15-24,000 individuals within this area, whereas the estimate of the Scopoli's Shearwater (*Calonectris diomedia*) is 6000 and that of the Yelkouan Shearwater (*Puffinus yelkouan)* between 840 and 1350 individuals (refer to the respective SPA data sheets for further information).

[4] *https://era.org.mt/en/Pages/Natura-2000-Datasheets-Maps.aspx.*

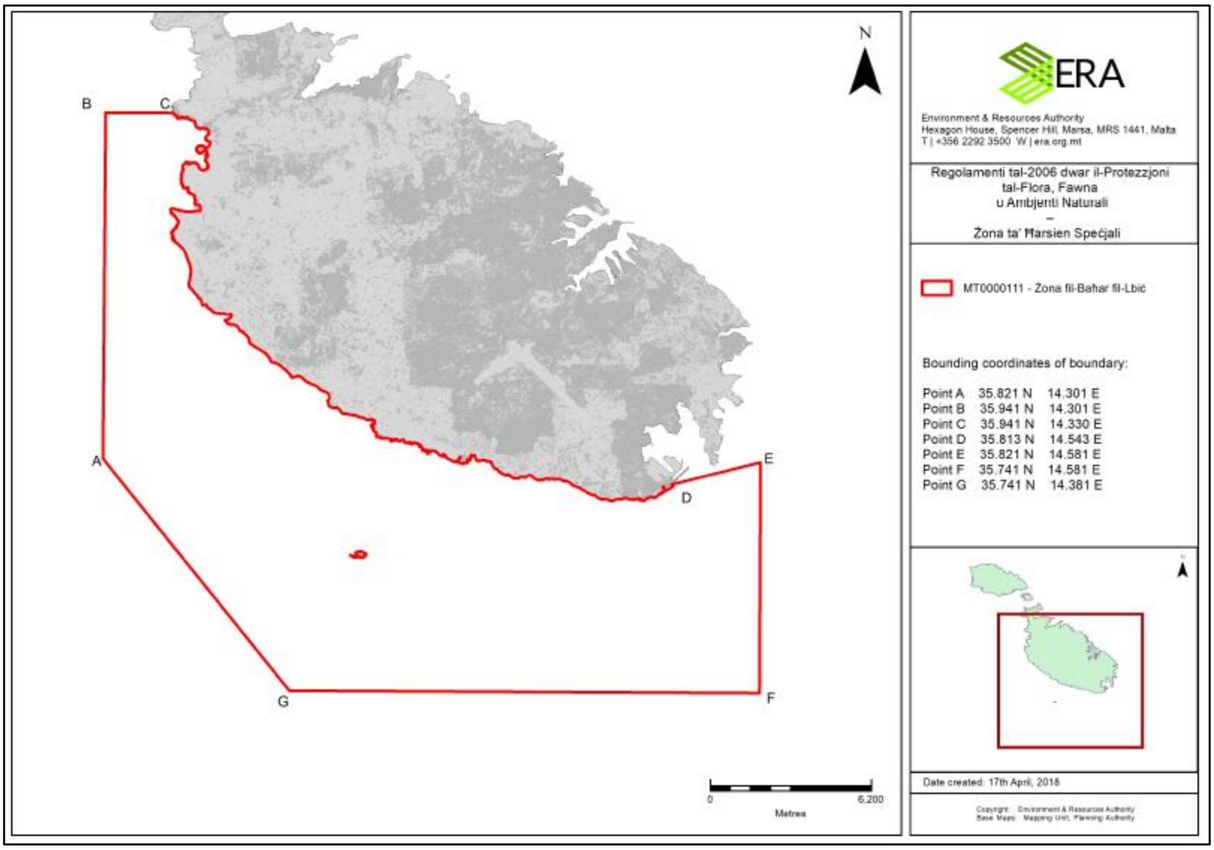


Figure 32: Żona fil-Baħar fil-Lbiċ N2K site.

3.2.1.3 Żona fil-Baħar fil-Lvant

The *Żona fil-Baħar fil-Lvant* is another very large area of sea along the east coast of the southern part of the island off the *Delimara* peninsula (Figure 33). The site was identified in the Maltese Marine IBA inventory as a result of the EU LIFE+ Malta Seabird Project (LIFE10 NAT/MT090) due to its importance for *Calonectris diomedia and Hydrobates pelagicus.*

The site is designated as a Special Protection Area via Government Notice 1311 of 2016, as declared through the provisions of the Flora, Fauna and Natural Habitats Regulations of 2016 [S.L. 549.44].

As outlined in the ERA N2K datasheets[4], the Storm Petrel (*Hydrobates pelagicus)* is deemed to have a population of 3800 individuals within this area most probably due to its proximity to its stronghold on *Filfla*, whereas the estimate of the Scopoli's Shearwater (*Calonectris diomedia*) is 3800.

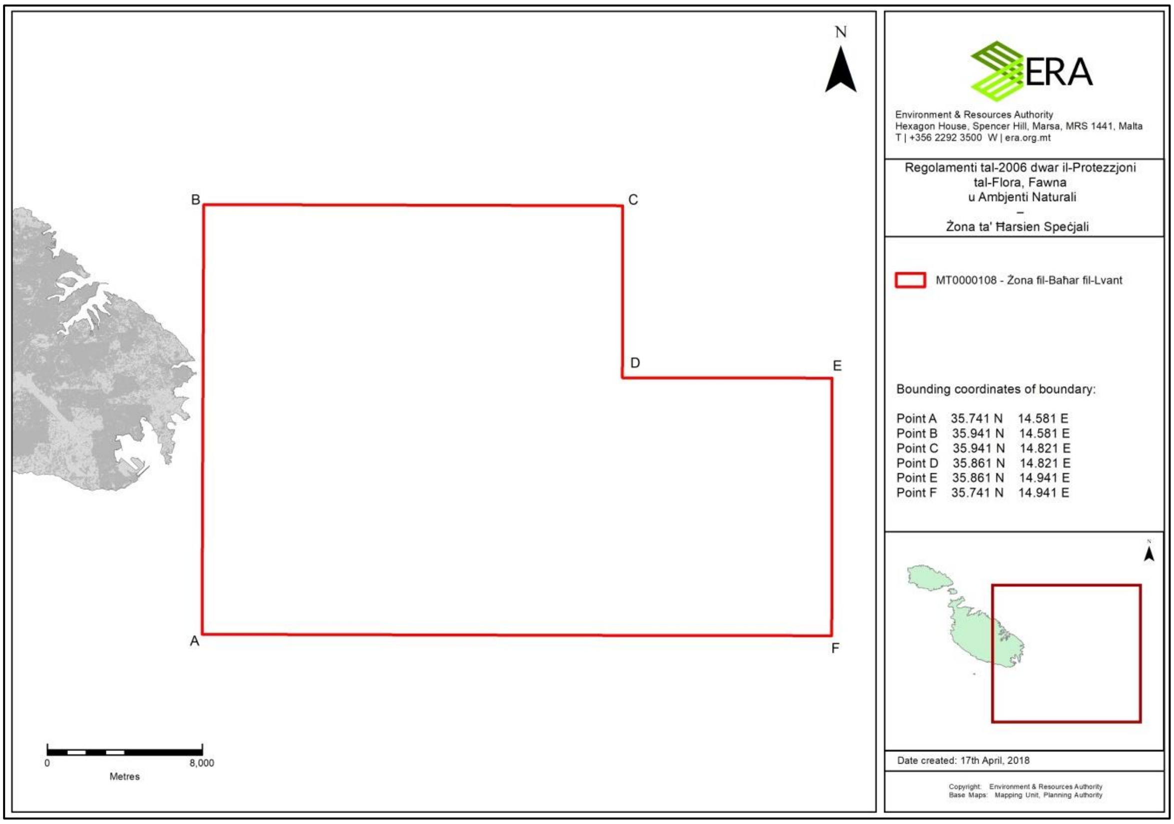


Figure 33: Żona fil-Baħar fil-Lvant N2K site

3.2.1.4 Żona fil-Baħar fil-Grigal

The *Żona fil-Baħar fil-Grigal* is a large area of sea along the north east coast of the island north of the *Żona fil-Baħar fil-Lvant*. The site was identified in the Maltese Marine IBA inventory as a result of the EU LIFE+ Malta Seabird Project (LIFE10 NAT/MT090) due to its importance for *Hydrobates pelagicus and Puffinus yelkouan.*

The site is designated as a Special Protection Area via Government Notice 1311 of 2016, as declared through the provisions of the Flora, Fauna and Natural Habitats Regulations of 2016 [S.L. 549.44].

As outlined in the ERA N2K datasheets[4], the Storm Petrel (*Hydrobates pelagicus)* is deemed to have a population of 1700 individuals whereas the estimate of the Yelkouan Shearwater (*Puffinus yelkouan*) is between 380 and 450 individuals.

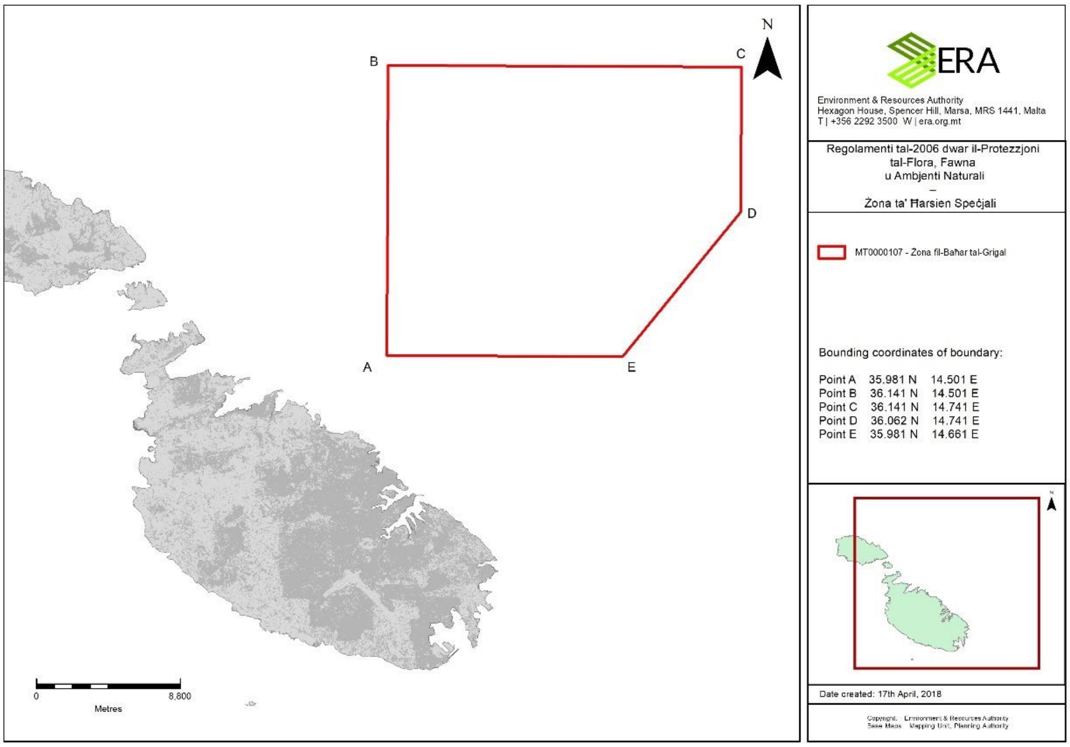


Figure 34: Żona fil-Baħar fil-Grigal N2K site

3.2.1.5 EU LIFE+ Malta Seabird Project (LIFE10 NAT/MT090)

The Life + Malta Seabird Project was led by Birdlife Malta in collaboration with the Ministry of Sustainable Development, The Environment and Climate Change, the RSPB and SPEA (Birdlife in Portugal). The project ran between September 2011 and June 2016.

The project utilised high-end technology to gather results about the lives of the three species of tubenose breeding in Malta. These results showed that these species utilise various parts of the areas around the Maltese islands for rafting prior to moving into their nests and also for feeding.

One of the major concerns for these species is disturbance from light sources which tend to keep adults at bay refraining from flying back into their nests and also disorients the offspring when they fly out of their nests hence light has a significant impact on the lives of these species.

The final outcome from this project was the declaration by the Maltese Government of a number of Marine Protected Areas around the islands, three of which are relevant to this project (Figure 35).

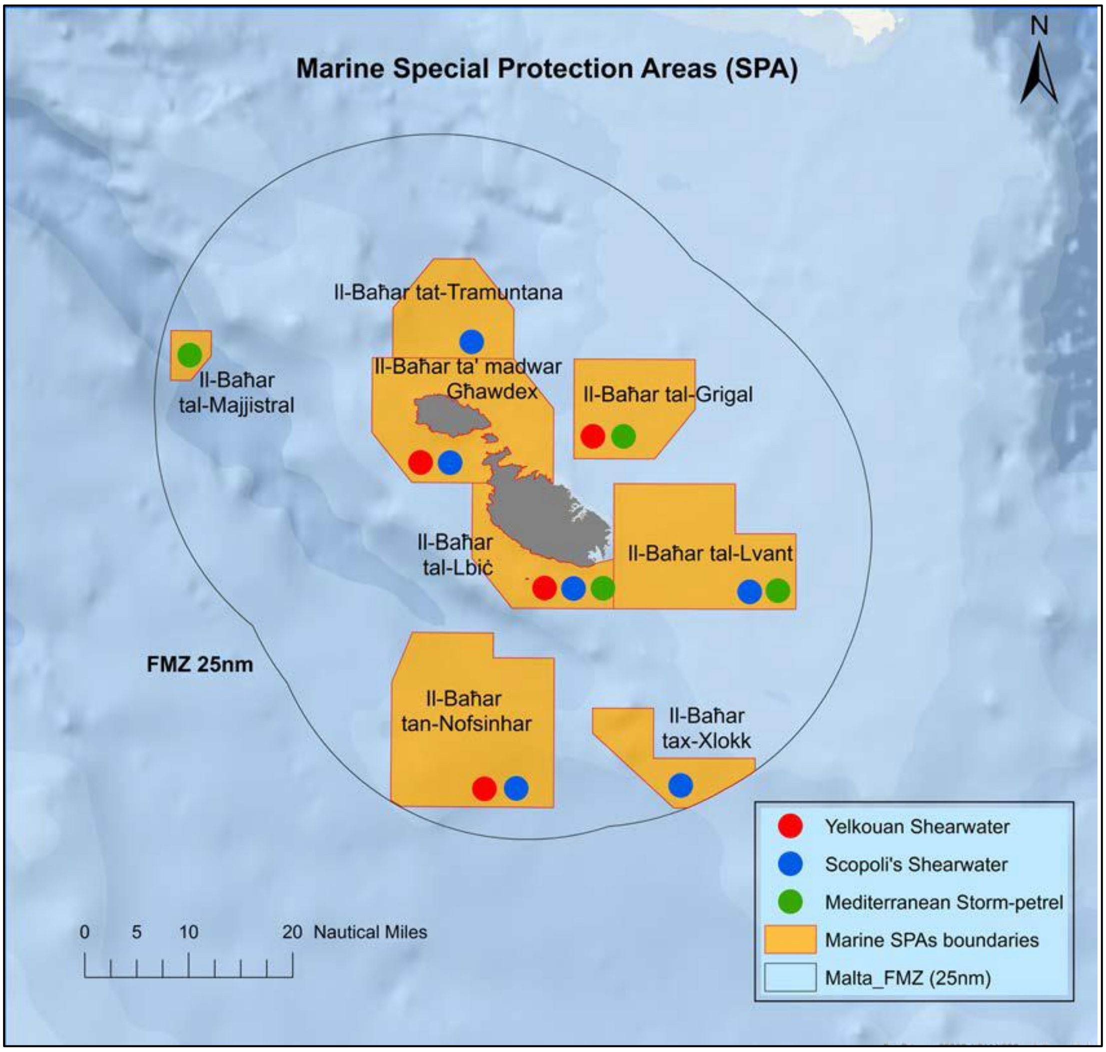


Figure 35: Marine SPAs around the Maltese Islands (source BLM, 2015)

3.2.1.6 International Conservation Status

The best source of data currently available to understand the status of wild birds is that provided by Birdlife International through its publication European Birds of Conservation Concern (EBCC), which is in its third review of the conservation status of all wild birds in Europe. The aim of the publication was to identify priority species (Species of European Conservation Concern, or SPECs) in order that conservation action can be undertaken to improve their status.

The geographical range for the data collection extends from Greenland to the Urals and from Macaronesia in the southwest to the Caucasus in the southeast. Data was collected through a network of national coordinators who sought input from experts, organizations and an army of field workers.

The methodology used in previous assessments was also used in the third version thus maintaining consistency.

The five categories which were developed in order to classify each species are outlined in Table 6.

Table 6: Categories to classify species

Category	Description
SPEC 1	European species of global conservation concern i.e. Critically Endangered, Vulnerable or Near Threatened at global level (Birdlife International 2016 a)
SPEC 2	Species whose global population is concentrated in Europe, and which is classified as Regionally Extinct, Critically Endangered, Endangered, Vulnerable, Near Threatened, Declining, Depleted or rare at European level (Birdlife International 2015, Butterfield *et al*)
SPEC 3	Species whose global population is not concentrated in Europe, but which is classified as Regionally Extinct, Critically Endangered, Endangered, Vulnerable, Near threatened, Declining, Depleted or rare at European level (Birdlife International 2015, Butterfield *et al*)
Non-SPEC^E	Species whose global population is concentrated in Europe, but whose population status is currently considered to be Secure (Butterfield *et al*)
Non-SPEC	Species whose global population is not concentrated in Europe and whose European population Status is currently considered to be Secure (Butterfield *et al*)

A species is considered as concentrated in Europe if more than 50% of its global breeding or wintering population or range occurs in Europe.

Table 7: Percentage of European species in each category in BiE1 *(1994),* BiE2 *(2004) and BiE3 (2017)*

<table>
<tr><th>Status</th><th>Birds in Europe 1994 (BiE1)</th><th>Birds in Europe 2004 (BiE2)</th><th>European Birds of Conservation Concern 2017 (EBCC)</th></tr>
<tr><td>SPEC 1</td><td>5</td><td>8</td><td>13</td></tr>
<tr><td>SPEC 2</td><td>8</td><td>9</td><td>7</td></tr>
<tr><td>SPEC 3</td><td>25</td><td>27</td><td>19</td></tr>
<tr><td>Non-SPEC^E</td><td>16</td><td>18</td><td rowspan="2">60</td></tr>
<tr><td>Non-SPEC</td><td>46</td><td>39</td></tr>
</table>

Table 7 shows that during the last fifteen years or so, birds in Europe continued to be threatened by widespread environmental change and many populations are in greater trouble than they were in the previous decade.

3.2.1.7 IUCN Threat Status

The assessment of the European Threat Status is based on the minimum European population size and the percentage of the total European population which is in countries where populations have declined. These criteria have therefore had to take into consideration the quality and availability of information on European bird populations, and calculations are thus based on categories of population trend rather than precise figures.

These assessments are made on the basis of breeding season data unless a species qualifies on winter data. Assessment of overall population trends based solely on the basis of the quantitative data which are available would introduce regional biases and therefore be invalid.

The criteria used in establishing the threat status was as follows:

- **Regionally Extinct [RE]** Where no reasonable doubt that the last individual in Europe has died. (If it is possible that the species survives, then it is CR (PE), i.e. Possibly Extinct.
- **Critically Endangered [CR]** if the European population meets any of the IUCN Red List Criteria for Critically Endangered species. Such species have an Unfavourable conservation status in Europe because they are considered to be facing an extremely high risk of extinction in the wild (IUCN, 2001).
- **Endangered [EN]** if the European population meets any of the IUCN Red List Criteria for endangered species. Such species have an Unfavourable conservation status in Europe because they are very likely to become extinct in the near future in the wild (IUCN, 2001).
- **Vulnerable [VU]** if the European population meets any of the IUCN Red List Criteria for vulnerable species. Such species have an Unfavourable conservation status in Europe because they are considered to become endangered unless the circumstances threatening its survival/reproduction recover(IUCN, 2001).
- **Near Threatened [NT]** if the European population is close to meeting the IUCN Red List criteria for VU.
- **Least Concern [LC]** if the European population does not meet any of the criteria listed above.

3.2.1.8 European Birds Directive

The EU Birds Directive (transposed into LN 79 of 2006 [S.L.549.42] and its subsequent amendments) provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. The main provisions of the Directive include, amongst others:

- The maintenance of the populations of all wild bird species across their natural range with the encouragement of various activities to that end.
- The identification and classification of Special Protected Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance. Together with Special Areas of Conservation (SAC) designated under the Habitats Directive, SPAs form a network of European protected areas known as Natura 2000 sites.
- The establishment of a general scheme of protection for all wild birds including specification of conditions under which hunting and falconry can be undertaken. Huntable species are listed on Annex II of the Directive.

The Birds Directive is a primary tool for delivery against EU obligations under global Conventions, including the Convention on Biological Diversity, the Ramsar and Bonn Conventions and the Plan of implementation of the World Summit on Sustainable Development. The EU had also committed itself to halting biodiversity decline by the year 2010. The full and proper implementation of both the Birds and Habitats Directives including the proper designation and adequate management of Natura 2000 sites should have been crucial to achieving this target.

EU member states are obliged under the above-mentioned Directives to:

- Take measures to conserve all naturally occurring bird species across the EU;
- Classify as Special Protected Areas (SPAs) the most suitable territories for species listed on Annex I of the Directive and migratory species;
- Maintain SPAs in Favourable conservation status;
- Prepare and implement management plans, setting clear conservation objectives for all SPAs in the EU 28;
- Provide co-financing of the management of these SPAs;
- Regulate hunting of certain species of birds listed in Annex II of the Birds Directive;
- Follow the procedure outlined in Article 6 of the Habitats Directive for carrying out appropriate assessments of environmental impacts on SPAs.

3.2.2 Birdwatching data

The literature review and data collected by Borg J.J. (2013)[5] was supplimented with data collected from sea watching over a period between 2016 and 2019 from two areas, one at *Xrobb l-Għaġin* Park and the environs and the other from the area of *San Tumas* limits of *Marsaskala*. Morning records were normally collected from dawn for about three hours and afternoon records were normally collected for another three hours pre dusk. Details of the avian record data are found in Table 8. Most of the effort was on birds flying out at sea or flying inland or migrating out. In fact, the highest numbers involved seabirds and resident birds with other migrants having much lower figures. The data covers different periods of the year and so can be considered as representative for the purposes of this report.

Table 8: Details of avian data collected from areas in the proximity of Scheme.

Date	Time of day	Location
03/06/2016	PM	*Xrobb l-Għaġin*
03/12/2016	PM	*San Tumas*
13/03/2016	PM	*San Tumas*
25/03/2016	PM	*San Tumas*
26/03/2016	PM	*San Tumas*
04/10/2016	AM / PM	*Xrobb l-Għaġin*
24/04/2016	AM / PM	*Xrobb l-Għaġin/ San Tumas*
29/10/2016	PM	*San Tumas*
25/02/2017	PM	*Xrobb l-Għaġin*
26/02/2017	PM	*Xrobb l-Għaġin*
18/03/2017	PM	*Xrobb l-Għaġin*
04/02/2017	PM	*San Tumas*

[5] *Borg J.J. (2013) Report on the vertebrate Fauna vis-à-vis Combined Cycle gas Turbine and Liquefied Natural Gas receiving, storage, and re-gasification facilities.*

Date	Time of day	Location
16/04/2017	PM	*Xrobb l-Għaġin*
29/10/2017	AM	*San Tumas*
17/03/2018	PM	*Xrobb l-Għaġin*
25/03/2018	PM	*San Tumas*
31/03/2018	PM	*Xrobb l-Għaġin*
04/01/2018	PM	*San Tumas*
05/12/2018	PM	*Xrobb l-Għaġin*
25/11/2018	PM	*Xrobb l-Għaġin*
14/02/2019	PM	*Xrobb l-Għaġin*
24/02/2019	AM	*San Tumas*
16/03/2019	PM	*San Tumas*
24/03/2019	PM	*San Tumas*
30/03/2019	PM	*Xrobb l-Għaġin/ San Tumas*
31/03/2019	PM	*San Tumas*
04/06/2019	PM	*San Tumas*
04/07/2019	AM	*San Tumas*
13/04/2019	PM	*Xrobb l-Għaġin*
14/04/2019	AM/PM	*Xrobb l-Għaġin/ San Tumas*
28/04/2019	AM	*San Tumas*
05/01/2019	AM	*San Tumas*
05/05/2019	AM	*San Tumas*

3.2.3 Review of potential breeding species in the proximity of the Scheme

Borg J.J (2013) gives a whole overview of the species of birds breeding along the *Delimara* peninsula. The following species were encountered at the time:

- Short-toed Lark (*Calandrella brachydactyla*)
- Blue Rock Thrush (*Monticola solitarus*)
- Zitting Cisticola (*Cisticola juncidis*)
- Sardinian Warbler (*Sylvia melanocephala*)
- Spectacled Warbler (*Sylvia conspicillata*)
- Spanish Sparrow (*Passer hispaniolensis*)
- Tree Sparrow (*Passer montanus*)

The only species found breeding in this area which is also an Annex I species is the Short-toed Lark which is also a SPEC 3 species.

3.2.4 Results and analyses

The list of birds recorded during the surveys during period 2016-19 in the area together with the review undertaken by Borg JJ (2013) together with their local and conservation status (SPEC and IUCN Red List (Europe)) is shown in Table 9. Those species which are Annex I species as shown in the Birds Directive are also indicated in the same list.

Table 9: List of all birds recording from area and reviewed together with their local and conservation status (SPEC, IUCN Red List (Europe) and Annex I species).

Common name	Latin name	Status in Malta				International Protection Status			Records of Species	
		Breeding[6]	Migrant	Winter visitor	Rare & Irregular	SPEC Category	IUCN Threat Status	Birds directive	Borg JJ (2013)	Field data 2016-19
Mute Swan	*Cygnus olor*				x	Non-SPEC	LC		x	
Greylag Goose	*Anser anser*				x	Non-SPEC	LC		x	
Common Shelduck	*Tadorna tadorna*		x	x		Non-SPEC	LC		x	x
Eurasian Wigeon	*Anas penelope*		x	x		Non-SPEC	LC		x	
Eurasian Teal	*Anas crecca*		x	x		Non-SPEC	LC		x	
Garganey	*Anas querquedula*		x			SPEC 3	LC		x	
Common Quail	*Coturnix coturnix*	VR	x			SPEC 3	LC		x	x
Little Grebe	*Tachybaptus ruficollis*	VR		x		Non-SPEC	LC		x	
Great Crested Grebe	*Podiceps cristatus*		x	x		Non-SPEC	LC		x	
Black-necked Grebe	*Podiceps nigricollis*			x		Non-SPEC	LC		x	
Scopoli's Shearwater	*Calonectris diomedea*	x (SV)				Non-SPEC	LC	I	x	x
Yelkouan Shearwater	*Puffinus yelkouan*	x (PR)				SPEC 1	LC	I	x	x
European Storm-petrel	*Hydrobates pelagicus*	x (SV)				Non-SPEC	LC	I	x	
Northern Gannet	*Morus bassanus*			x		Non-SPEC	LC		x	x
Great Cormorant	*Phalacrocorax carbo*			x		Non-SPEC	LC		x	x
Eurasian Bittern	*Botaurus stellaris*		x			SPEC 3	LC	I	x	
Little Bittern	*Ixobrychus minutus*	VR	x			SPEC 3	LC	I	x	
Night Heron	*Nycticorax nycticorax*		x			SPEC 3	LC	I	x	x
Squacco Heron	*Ardeola ralloides*		x			SPEC 3	LC	I	x	x
Cattle Egret	*Bubulcus ibis*				x	Non-SPEC	LC		x	
Little Egret	*Egretta garzetta*		x	x		Non-SPEC	LC	I	x	x
Great White Egret	*Ardea alba*		x			Non-SPEC	LC	I	x	x
Grey Heron	*Ardea cinerea*		x	x		Non-SPEC	LC		x	x
Purple Heron	*Ardea purpurea*		x			SPEC 3	LC	I	x	x
Glossy Ibis	*Plegadis falcinellus*		x			Non-SPEC	RE	I	x	
Eurasian Spoonbill	*Platalea leucorodia*		x			Non-SPEC	LC	I	x	
Greater Flamingo	*Phoenicopterus roseus*		x			Non-SPEC	LC	I	x	

[6] ***SV**: Summer visitor; **VR**: Very rare breeder (few records, not yearly); **PR**: Partial resident*

Common name	Latin name	Status in Malta				International Protection Status			Records of Species	
		Breeding[6]	Migrant	Winter visitor	Rare & Irregular	SPEC Category	IUCN Threat Status	Birds directive	Borg JJ (2013)	Field data 2016-19
Egyptian Vulture	*Neophron percnopterus*					SPEC 1	EN	I		x
Honey-buzzard	*Pernis apivorus*		x			Non-SPEC	LC	I		x
Black Kite	*Milvus migrans*		x			SPEC 3	LC	I		x
Marsh Harrier	*Circus aeruginosus*		x			Non-SPEC	LC	I	x	x
Pallid Harrier	*Circus macrourus*		x			SPEC 1	NT	I		x
Montagu`s Harrier	*Circus pygargus*		x			Non-SPEC	LC	I	x	x
Osprey	*Pandion halieatus*		x			Non-SPEC	LC	I	x	x
Lesser Kestrel	*Falco naumanni*		x			SPEC 3	LC	I	x	x
Common Kestrel	*Falco tinnunculus*	VR	x	x		SPEC 3	LC		x	x
Red-footed Falcon	*Falco vespertinus*		x			SPEC 1	NT	I		x
Hobby	*Falco subbuteo*		x			Non-SPEC	LC		x	x
Eleonora`s Falcon	*Falco eleonorae*		x			Non-SPEC	LC	I	x	
Water Rail	*Rallus aquaticus*		x	x		Non-SPEC	LC		x	
Spotted Crake	*Porzana porzana*		x	x		Non-SPEC	LC	I	x	
Moorhen	*Gallinula chloropus*	x	x			Non-SPEC	LC		x	
Common Coot	*Fulica atra*		x	x		SPEC 3	NT		x	
Common Crane	*Grus grus*		x			Non-SPEC	LC	I	x	x
Oystercatcher	*Haematopus ostralegus*		x			SPEC 1	VU		x	
Little Bustard	*Tetrax tetrax*				x	SPEC 1	VU	I		x
Black-winged Stilt	*Himantopus himantopus*		x			Non-SPEC	LC	I		x
Avocet	*Recurvirostra avosetta*		x			Non-SPEC	LC	I	x	
Stone-curlew	*Burhinus oedicnemus*		x			SPEC 3	LC	I		x
Little Ringed Plover	*Charadrius dubius*	x	x			Non-SPEC	LC		x	
Ringed Plover	*Charadrius hiaticula*		x			Non-SPEC	LC		x	
Dotterel	*Charadrius morinellus*		x			Non-SPEC	LC	I		x
Little Stint	*Calidris minuta*		x	x		Non-SPEC	LC		x	
Eurasian Curlew	*Numenius arquata*		x			SPEC 1	VU		x	
Common Redshank	*Tringa totanus*		x	x		SPEC 2	LC		x	x
Green Sandpiper	*Tringa ochropus*		x			Non-SPEC	LC		x	x
Wood Sandpiper	*Tringa glareola*		x			SPEC 3	LC	I		x

Common name	Latin name	Status in Malta				International Protection Status			Records of Species	
		Breeding[6]	Migrant	Winter visitor	Rare & Irregular	SPEC Category	IUCN Threat Status	Birds directive	Borg JJ (2013)	Field data 2016-19
Common Sandpiper	*Actitis hypoleucos*		x	x		SPEC 3	LC			x
Pomarine Skua	*Stercorarius pomarinus*		x			Non-SPEC	LC		x	x
Arctic Skua	*Stercorarius parasiticus*				x	Non-SPEC	LC			x
Great Skua	*Catharacta skua*		x			Non-SPEC	LC		x	x
Pallas Gull	*Ichthyaetus ichthyateus*				x	Non-SPEC				x
Mediterranean Gull	*Larus melanochephalus*		x	x		Non-SPEC	LC	I	x	x
Little Gull	*Larus minutus*			x		SPEC 3		I	x	
Black-headed Gull	*Larus ridibundus*		x	x		Non-SPEC	LC		x	x
Slender-billed Gull	*Larus genei*		x			Non-SPEC	LC	I	x	
Audouin`s Gull	*Larus audouinii*			x		Non-SPEC	LC	I	x	x
Lesser Black-backed Gull	*Larus fuscus*		x	x		Non-SPEC	LC		x	x
Yellow-legged Gull	*Larus michahellis (CACHINNANS)*	x	x	x		Non-SPEC	LC		x	x
Kittiwake	*Rissa tridactyla*				x	SPEC 3	VU			x
Gull-billed Tern	*Gelochelidon nilotica*		x			SPEC 3	LC	I	x	
Caspian Tern	*Hydroprogne caspia*		x			Non-SPEC	LC	I	x	x
Whiskered Tern	*Chlidonias hybrida*		x			Non-SPEC	LC	I		x
Black Tern	*Chlidonias niger*		x			SPEC 3	LC	I	x	
White-winged Black Tern	*Chlidonias leucopterus*		x			Non-SPEC	LC		x	
Sandwich Tern	*Sterna sandvicensis*		x	x		Non-SPEC	LC	I	x	x
Collared Dove	*Streptopelia decaocto*	x				Non-SPEC	LC		x	x
Turtle Dove	*Streptopelia turtur*	VR	x			SPEC 1	VU		x	x
Great Spotted Cuckoo	*Clamator glandarius*		x			Non-SPEC	LC		x	
Common Cuckoo	*Cuculus canorus*	VR	x			Non-SPEC	LC		x	
Barn Owl	*Tyto alba*		x		x	SPEC 3	LC		x	
Eurasian Scops Owl	*Otus scops*		x	x		SPEC 2	LC		x	
Long-eared Owl	*Asia otus*		x			Non-SPEC	LC			x
Short-eared Owl	*Asio flammeus*	VR	x	x		SPEC 3	LC	I	x	x
European Nightjar	*Caprimulgus europaeus*		x			SPEC 3	LC	I	x	

Common name	Latin name	Status in Malta				International Protection Status			Records of Species	
		Breeding[6]	Migrant	Winter visitor	Rare & Irregular	SPEC Category	IUCN Threat Status	Birds directive	Borg JJ (2013)	Field data 2016-19
Alpine Swift	*Apus melba*		x			Non-SPEC	LC		x	x
Common Swift	*Apus apus*	VR	x			SPEC 3	LC		x	x
Pallid Swift	*Apus pallidus*		x			Non-SPEC	LC		x	x
Little Swift	*Aopus affinis*				x	SPEC 3	VU			x
Common Kingfisher	*Alcedo atthis*		x	x		SPEC 3	VU	I	x	
European Bee-eater	*Merops apiaster*		x			Non-SPEC	LC		x	x
European Roller	*Coracias garrulus*		x			SPEC 2	LC	I	x	
Hoopoe	*Upupa epops*		x			Non-SPEC	LC		x	x
Wryneck	*Jynx torquilla*		x	x		SPEC 3	LC		x	
Short-toed Lark	*Calandrella brachydactyla*	x (SV)	x			SPEC 3	LC	I	x	x
Sky Lark	*Alauda arvensis*		x	x		SPEC 3	LC		x	x
Wood Lark	*Lullula arborea*				x	SPEC 2	LC	I	x	
Sand Martin	*Riparia riparia*		x			SPEC 3	LC		x	x
Barn Swallow	*Hirundo rustica*	VR	x	x		SPEC 3	LC		x	x
House Martin	*Delichon urbicum*	VR	x			SPEC 2	LC		x	x
Red-rumped Swallow	*Cecropis daurica*		x			Non-SPEC	LC			x
Tawny Pipit	*Anthus campestris*	VR	x			SPEC 3	LC	I	x	x
Tree Pipit	*Anthus trivialis*		x			SPEC 3	LC		x	x
Meadow Pipit	*Anthus pratensis*		x	x		SPEC 1	NT		x	x
Red-throated Pipit	*Anthus cervinus*		x	x		Non-SPEC	LC		x	
Yellow Wagtail	*Motacilla flava*		x			SPEC 3	LC		x	x
Grey Wagtail	*Motacilla cinerea*		x	x		Non-SPEC	LC		x	
White Wagtail	*Motacilla alba*		x	x		Non-SPEC	LC		x	x
Dunnock	*Prunella modularis*		x	x		Non-SPEC	LC		x	
Robin	*Erithacus rubecula*	VR	x	x		Non-SPEC	LC		x	x
Common Nightingale	*Luscinia megarhynchos*	VR	x			Non-SPEC	LC		x	x
Black Redstart	*Phoenicurus ochruros*		x	x		Non-SPEC	LC			x
Common Redstart	*Phoenicurus phoenicurus*		x			Non-SPEC	LC			x
Whinchat	*Saxicola rubetra*		x			SPEC 2	LC			x
Common Stonechat	*Saxicola torquatus*		x	x		Non-SPEC	LC		x	x
Isabelline Wheatear	*Oenanthe isabellina*				x	Non-SPEC	LC			x
Northern Wheatear	*Oenanthe oenanthe*		x	x		SPEC 3	LC		x	x

Common name	Latin name	Status in Malta				International Protection Status			Records of Species	
		Breeding[6]	Migrant	Winter visitor	Rare & Irregular	SPEC Category	IUCN Threat Status	Birds directive	Borg JJ (2013)	Field data 2016-19
Black-eared Wheatear	*Oenanthe hispanica*	VR	x			Non-SPEC	LC		x	x
Blue Rock Thrush	*Monticola solitarus*	x				Non-SPEC	LC		x	x
Blackbird	*Turdus merula*		x	x		Non-SPEC	LC			x
Song Thrush	*Turdus philomelos*		x	x		Non-SPEC	LC		x	x
Cetti's Warbler	*Cettia cetti*	x				Non-SPEC	LC		x	
Zitting Cisticola	*Cisticola juncidis*	x				Non-SPEC	LC		x	x
Reed Warbler	*Acrocephalus scirpaceus*	x	x			Non-SPEC	LC		x	
Icterine Warbler	*Hippolais icterina*		x			Non-SPEC	LC			x
Blackcap	*Sylvia atricapilla*		x	x		Non-SPEC	LC		x	x
Garden Warbler	*Sylvia borin*		x			Non-SPEC	LC			x
Common Whitethroat	*Sylvia communis*		x			Non-SPEC	LC			x
Spectacled Warbler	*Sylvia conspicillata*	x				Non-SPEC	LC		x	x
Subalpine Warbler	*Sylvia cantillans*		x			Non-SPEC	LC		x	x
Sardinian Warbler	*Sylvia melanocephala*	x	x			Non-SPEC	LC		x	x
Wood Warbler	*Phylloscopus sibilatrix*		x			Non-SPEC	LC		x	
Common Chiffchaff	*Phylloscopus collybita*		x	x		Non-SPEC	LC			x
Willow Warbler	*Phylloscopus trochilus*		x			SPEC 3	LC		x	x
Spotted Flycatcher	*Muscicapa striata*	x	x			SPEC 2	LC		x	x
Collared Flycatcher	*Ficedula aLbiċollis*		x			Non-SPEC	LC	I	x	
Pied Flycatcher	*Ficedula hypoleuca*		x			Non-SPEC	LC		x	x
Golden Oriole	*Oriolus oriolus*		x			Non-SPEC	LC		x	x
Red-backed Shrike	*Lanius collurio*		x			SPEC 2	LC	I	x	
Woodchat Shrike	*Lanius senator*	x	x			SPEC 2	LC		x	x
Common Starling	*Sturnus vulgaris*	x	x	x		SPEC 3	LC		x	x
Spanish Sparrow	*Passer hispaniolensis*	x				Non-SPEC	LC		x	x
Tree Sparrow	*Passer montanus*	x	x			SPEC 3	LC		x	x
European Serin	*Serinus serinus*	VR	x	x		SPEC 2	LC		x	
Greenfinch	*Carduelis chloris*	VR	x	x		Non-SPEC	LC		x	
Linnet	*Carduelis cannabina*	VR	x	x		SPEC 2	LC		x	x

Common name	Latin name	Status in Malta				International Protection Status			Records of Species	
		Breeding[6]	Migrant	Winter visitor	Rare & Irregular	SPEC Category	IUCN Threat Status	Birds directive	Borg JJ (2013)	Field data 2016-19
Corn Bunting	*Emberiza calandra*	x	x			SPEC 2	LC		x	
Ortolan Bunting	*Emberiza hortulana*				x	SPEC 2	LC	I	x	

Various species in the list shown on Table 9 which were recorded or reviewed for the area are either SPEC 1 or Annex I species, however, those which are of main concern for the Scheme are the seabirds, namely the Scolpoli's (Annex I and Non-SPEC), Yelkouan Shearwater (Annex I and SPEC 1) and the Storm Petrel (Annex I and Non-SPEC). The closest colonies of the Shearwaters are found along the cliffs starting off from *Bengħisa* and beyond heading north whereas in the case of the Storm Petrel the strongest colony is *Filfla* albeit there are some records of breeding along the cliffs. The above mentioned data recorded both Shearwater species but no Storm Petrels, the latter being a relatively small bird, hard to see from a distance and tends to move inshore at night whereas, the Shearwaters were recorded in double (Yelkouan) and triple digits (Scopoli's) figures. Both are usually seen flying a few centimetres above the water level several hundreds of metres away from the shore, albeit occasionally one can also witness some pretty close to land. Occasionally, one can witness bird rafting even from land. The presence of fish farms offshore has also changed the dynamics of these birds which are occasionally seen flying close by these structures. Borg (2013) reports the presence of double and triple figures of Storm Petrels around fish farms.

The Scheme will have a permanent structure added to the existing DPS complex which in terms of size, can be considered as minimal when compared to the rest of the DPS. At the time of writing one needs to consider two scenarios for the presence of the FSU tanker. The first scenario is that it will remain present on site irrespective of the gas pipeline whereas, the second scenario sees its removal. In the case where the FSU remains on site impacts resulting from the proposed Terminal will be added to those already present from the FSU, whereas in the case of its removal impacts resulting from lights arising from this structure and the remaining pier will be reduced. So the only remaining effect on avifauna species will be that arising from light on the pier and from lights from the area occupied from the Terminal Station.

The impacts which could have an effect on avifauna species is that taking place during the construction and laying of the pipeline. This impact will be spread throughout the whole length of the development but would be mostly pronounced closer to land. This is mainly due to the fact that the seabird species tend to use areas in the proximity for rafting prior to reaching their breeding grounds and for feeding purposes. There could be an additional impact on the fledglings which are attracted by light.

Migratory species could also be affected by light since a good number of them tend to migrate also during the night.

Tunnelling works could have an impact on Short Toed Lark (*Calandrella brachydactyla*) which is an Annex I species which is recording breeding in the area. This could mainly result from vibrations transmitted mainly during such works.

The construction period at sea will take about five to six months, however, other activities could be taking place prior and after laying of the pipeline. There could also be setbacks resulting from adverse weather conditions and other problems encountered along the route which would prolong the process. These activities could have a temporary effect on these species during this period.

Borg JJ (2013) reports that young birds of both Yelkouan and Scopoli's Shearwater have been collected from *Marsaxlokk* bay (*Birżebbuġa*, Freeport area, DPS) after being disoriented and dazzled by bright lights. He also reported that three recently fledged Storm Petrels were also collected from near the *Delimara* Lighthouse after being disoriented by bright lights.

4.0 Impact Assessment vis-à-vis the integrity of the site and its species, habitats and ecosystems

The methodology outlined below was performed to determine the impact assessment of the project on the Natura 2000 sites. When an impact could not be determined with certainty, the worst-case scenario was taken. The impact assessment will be conducted in line with the guidance document 'Assessment of plans and projects significantly affecting Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC' (EC, 2001).

4.1 Marine Study

The impact assessment section of the study covered the following aspects:

- a description of the impact of the project on conservation objectives for the area and protected species and habitats it harbours, and on other indicators, including impacts on key species, extent of fragmentation, etc. As specified within the Terms of Reference issued by the ERA, any impact interactions (e.g. accumulation, synergy, interaction with natural forces) were also identified and assessed, and the impact assessment exercise conducted also took into account practical implications (e.g. conflicts with site protection or management plan implementation, any foreseeable constraints on future management plan formulation, etc.)

- a description of proposed measures to eliminate, mitigate or compensate anticipated adverse effects on protected species and habitats. The following aspects related to the proposed mitigation measures were considered and assessed:
  - A reasonably detailed identification of the measures to be introduced for all relevant phases of the project;
  - An explanation of how the measures will eliminate and/or mitigate adverse effects;
  - Evidence of how the mitigation measures will be tangibly implemented and by whom;
  - Evidence of the degree of confidence in their likely success;
  - A timescale, relative to the project, when they will be implemented;
  - Explanation of how any mitigation failure will be addressed; and
  - Proposals for decommissioning as appropriate.

- a description of any anticipated residual adverse effects arising from the proposed development on protected species and habitats

- proposal of a feasible ecological monitoring programme, for the pre-, during and post-construction phases, to include details such as the frequency of the proposed monitoring scheme.

- a comprehensive evaluation of all possible project alternatives/scenarios (including the zero option) and their impacts on protected species and habitats. Potential alternative schemes might include alternative technologies, alternative layouts, and relocation or downsizing of the project.

The impact assessment exercise will be extended to the decommissioning phase, as requested within the ToR issued by the ERA.

The degree of impingement on marine ecological systems from the area by anticipated alterations in the hydrodynamic and physico-chemical regimes as a result of the proposed development will also be assessed. This will be achieved by consulting the reports emerging from the ad hoc hydrodynamic studies being commissioned for the Area of Study.

4.1.1 Impact Significance

The following information will be provided for each of the identified impacts:

- Description of the impact;
- Magnitude and significance;
- Duration (temporary or permanent);
- Extent (in relation to site coverage and surroundings and associated features);
- Direct or indirect impact;
- Adverse or beneficial;
- Reversible or irreversible effects of the impact and extent or irreversibility as well as description of any
- associated conditions/assumptions for irreversibility;
- Sensitivity of resources to impacts;
- Probability of impact occurring;
- Confidence level/limits to impact prediction;
- Scope of mitigation/enhancement; and
- Residual impacts.

The impacts that may possibly arise from the proposed development will be assessed on the basis of the following criteria:

Duration of Impact	
Permanent	Impact would still be detectable following decommissioning of project
Temporary	Impact would persist throughout the phase of project under consideration only

Extent of Impact	
Very local	Within 10m from proposed development
Local	10 to 50m from proposed development
Broad	50 to 500m from proposed development
Very broad	More than 500m from proposed development

Impact Significance	
Significant	Will affect keystone and/or protected species and/or habitats
Not Significant	Will not affect any keystone and/or protected species and/or habitats

Degree of Confidence/Certainty	
1	Literature consists of scientifically founded speculations
2	Research is in its infancy and inconclusive
3	Available literature provides a fair basis for assessments
4	Available literature provides a good basis for assessments
5	Evidence base is relatively solid

4.1.2 Construction phase

The main activities relevant to the project which are envisaged to lead to substantial marine ecology impacts during the Construction Phase are the following:

- Excavation of an underwater pre-trenched transition zone
- Pipeline laying activities
- Release of large volumes of wash water following hydrotesting
- Release of drilling fluids into the marine environment
- Land reclamation at the envisaged gas terminal site in Delimara
- Installation of pipeline supporting structures
- Installation of pipeline cable crossing features
- Benthic impacts from servicing vessels (for trenching and drilling activities)
- Abandonment and recovery of abandoned pipeline components during rough weather
- Anthropogenic generation of submarine noise

4.1.2.1 Nearshore: Land reclamation

The development of the proposed land-based gas terminal entails the reclamation of 8,000 m^2 of seabed in close proximity of the existing Delimara power station. Land reclamation will be realised through the construction of a breakwater, needed also to protect the new plant from wave action, and the backfilling with suitable material of the area up to the project elevation of the plant (6.5 m above sea level). The breakwater of about 230 m perimeter is located in the inner Marsaxlokk Bay in front of Delimara Regassification Plant. Rubble mound breakwater/revetment is foreseen for the project. It consists of piles of stones more or less sorted according to their unit weight: smaller stones for the core and larger stones as an armour layer protecting the core from wave attack. Rock or concrete armour units on the outside of the structure absorb most of the energy, while gravels or sands prevent the wave energy from continuing through the breakwater core. Aspects of the nearshore area to be reclaimed are given in Figure 36.

Figure 36: Aspects of the nearshore area to be reclaimed

The footprint that the proposed breakwater will constitute on the seabed is higher than what their above-water extent suggests. In fact, from drawings of the proposed breakwaters (one of which is reproduced below as Figure 37), it transpires that in addition to the actual footprint of the breakwater itself, armour resting on the underlying ‘toe mound’ will be positioned on the seabed at the outermost extremity of the same breakwaters, further extending the footprint of the entire construction.

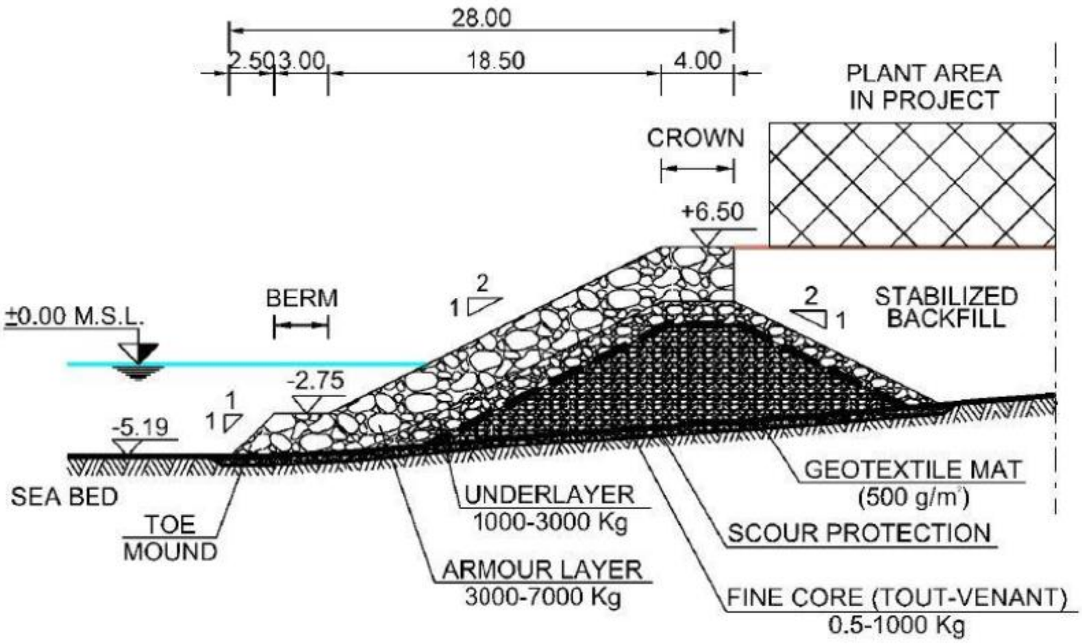


Figure 37: Schematic outline of the breakwater along the periphery of the nearshore area to be reclaimed.

4.1.2.2 Nearshore: Re-suspension of fine sediments

According to Gupta et al. (2005), dredging and reclamation result in the formation of plumes of suspended sediments around dredgers, reclamation outfalls and dumping grounds. Dredging and dredge spoil disposal activities can induce short- and long-term impacts on marine systems, namely resuspension and settlement of sediments, portioning of toxic contaminants and reintroduction to the water column; contaminant uptake by and accumulation in fish and shellfish, increased turbidity causing decrease in light penetration and associated photosynthetic activity, short-term depletions of dissolved oxygen levels; modified bathymetry causing changes in circulation; possible saltwater intrusion to ground-water; inland surface water; altered species diversity and structure of benthic communities; fluctuations in water chemistry, changes in shoreline structure; loss of habitat and fisheries resources. Re-settlement of the re-mobilised particulates can also lead to changes in sediment budgets and to the possible siltation of benthic species.

The re-suspension of fine sediments as a result of the disturbance of the seabed during the construction phase will augment turbidity and murkiness. This in turn will result in reduced levels of illumination reaching the photic zone and could possibly result in the regression of seagrasses and macroalgal species inherently dependent on good levels of light penetration in the water column, as well as impact on filter-feeding species whose filtering apparatus (e.g. siphon) might be clogged through such a re-suspension.

The marine ecology impacts arising with the heightened re-suspension and re-deposition of fine benthic sediment fractions as a land reclamation-associated dredging works within Marsaxlokk Bay are anticipated to be Moderate given the relatively coarse nature of the benthic sediment enclosed within the seabed area to be reclaimed, which would thus restrict the extent of sediment mobilisation through disturbance of the same seabed, and the relatively large intervals between the area to be reclaimed and the current distribution of seagrass meadows. Conversely, the anticipated obliteration of benthic communities through the same land reclamation activities falling within the footprint of the proposed coastal constructions are unavoidable and irreversible.

The potential for marine ecology impacts to arise through the atmospheric deposition of fine particulates is high given:

(i) the typology of heavy machinery to be deployed and hoarded in the coastal zone immediately contiguous to the intervention areas, consisting of an excavator crane, bulldozers, trucks, pilers and cranes, which will inevitably disturb terrestrial surface sediment, the fine portions of which will become air-borne;
(ii) the coastal nature of the heavy machinery hoarding area, in close proximity to the marine waters under study and
(iii) the semi-arid climate of the Maltese Islands, with at least some of the works being conducted during the dry season, heightening the probability of having loose, unconsolidated terrestrial sediment.

Upon settling in the sea, considerable volumes of these fine particulates can lead to an increase in water turbidity and decrease in water transparency, analogous to the disturbance of benthic sediment during dredging but on a lower scale in view of the smaller volumes of fine particulates which will be involved.

The re-suspended benthic sediment might contain sequestered (i.e. not available for uptake by biota) pollutants (e.g. mercury) and nutrients (e.g. organic nitrogen) which might be released into the water column upon disturbance of the seabed (e.g. Kaiser et al., 2003) as a result of proposed works. The subsequent decomposition of such released pollutants and sediments by micro-organisms will result in a depletion of oxygen levels, analogous to large-scale eutrophication events. Depletion of dissolved oxygen may also be compounded by the re-suspension of anoxic sediments as a result of excavation works, although the reports compiled by the PMRS contractor has underscored the low productivity levels of waters sampled within the study area.

4.1.2.3 Nearshore: hydrodynamic impacts

In terms of putative hydrodynamic changes that the proposed land reclamation might induce, the specialised, ad hoc hydrodynamic study commissioned to assess such a possibility concluded that no significant modifications to the prevailing hydrodynamic regime within Marsaxlokk Bay would be induced by the same proposals. This essentially means that the present metocean conditions (in terms of nearshore waves, nearshore currents and residual wave agitation) are not expected to significantly change in the future configuration.

4.1.2.4 Nearshore: Trenchless drilling impacts

The excavation of an underwater pre-trenched transition zone will be necessary to ensure proper alignment between the offshore pipeline with the micro-tunnelling offshore exit point. After the preliminary excavation, the trench will be backfilled with the excavated material to create an artificial receiving pit in which the TBM will stop the drilling and it will be easily discovered from the backfilled material, as shown in Figure 38.

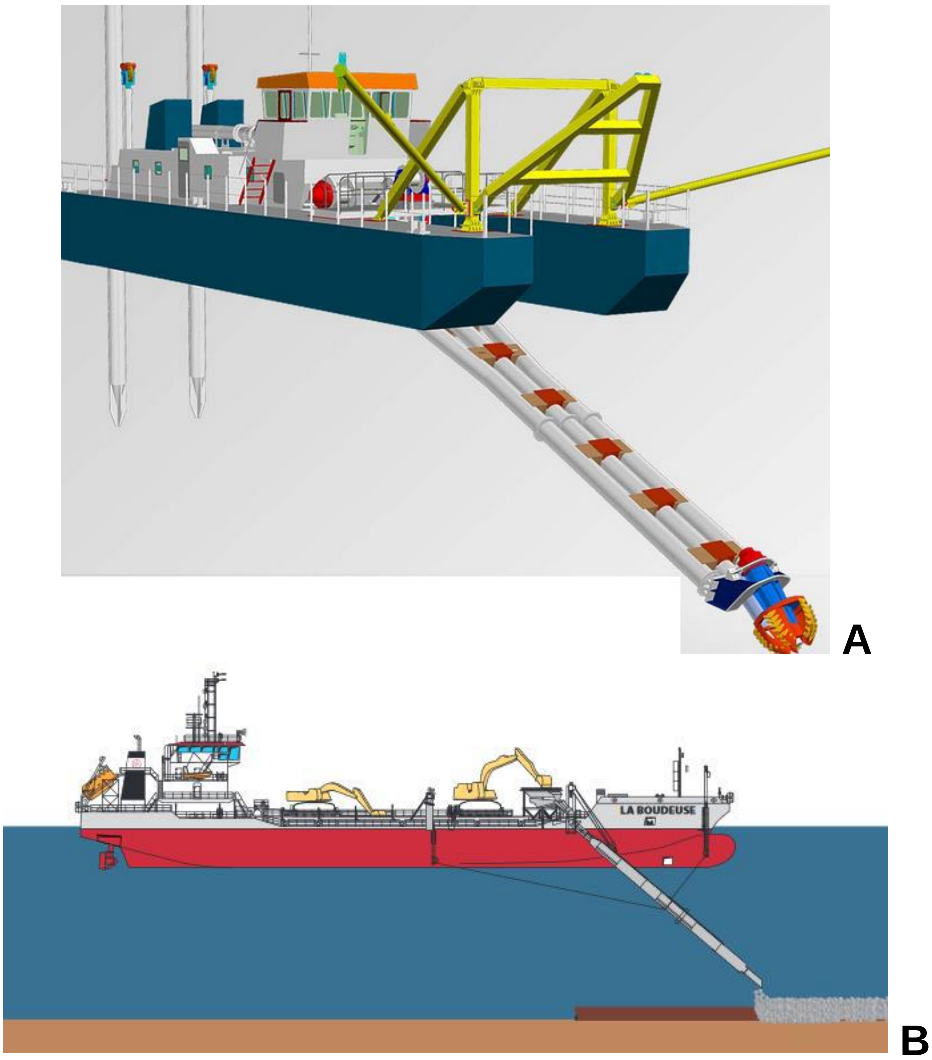


Figure 38: A schematic view of a typical multipurpose vessel for a backfilling with fall pipe

The excavation of such a 150m-long, 5m-deep pit is envisaged to generate an estimated 9,500m^3 of spoils, which should be largely reused through a mud cleaning and recycling facility, as shown in the schematic outline of the excavation pit represented by Figure 38below. Nevertheless, the contractor might trench a deeper pit in order to enable access by the dredger and to allow recovery of pre-backfilling before TBM recovery. The benthic assemblages falling directly within the footprint of the benthic area to be excavated will be irreversibly obliterated, with the same footprint presenting limited opportunities for recovery given the laying of a bedding layer over the trench bottom so as to reduce the 'interference' of the seabed with the same trench contents. The applicants are confident that design of proposed excavation pit has been optimised so as to minimise its footprint and environmental impact.

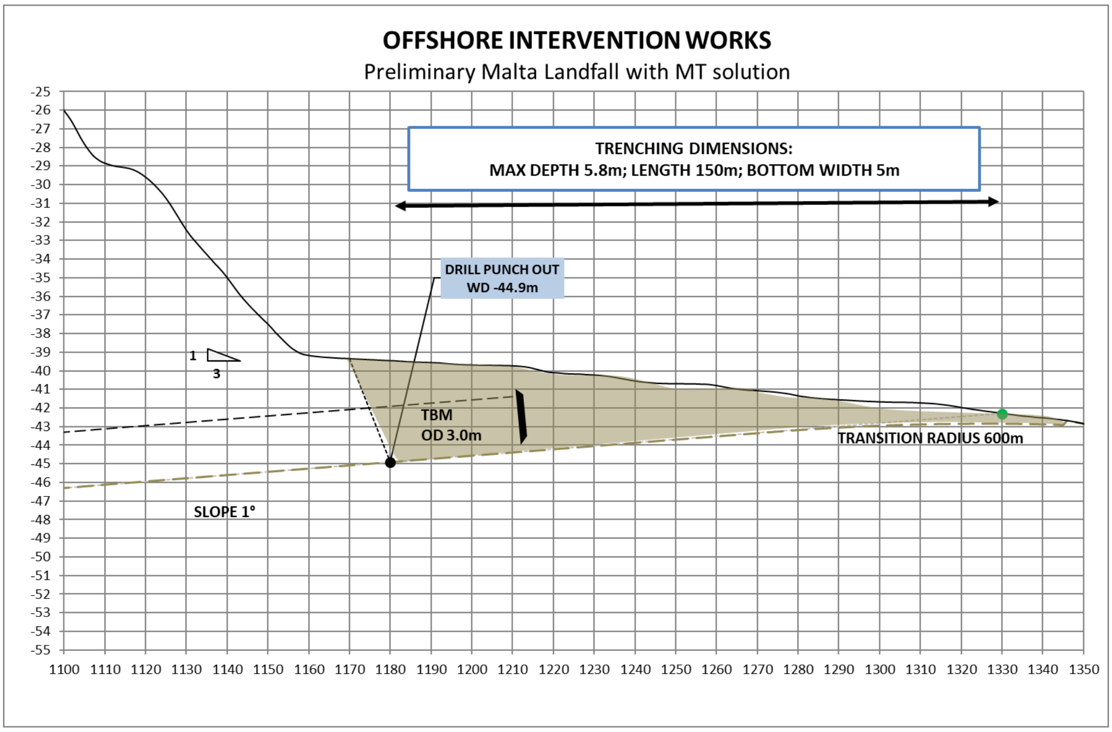


Figure 39: Schematic outline of the proposed transition pit

The dredging associated with this aspect of the project is expected be carried out from jack-up platforms, or even fixed structures, as shown in Figure 40 below, and this will exacerbate benthic impacts on sensitive assemblages, especially through the extensive associated anchoring impacts.

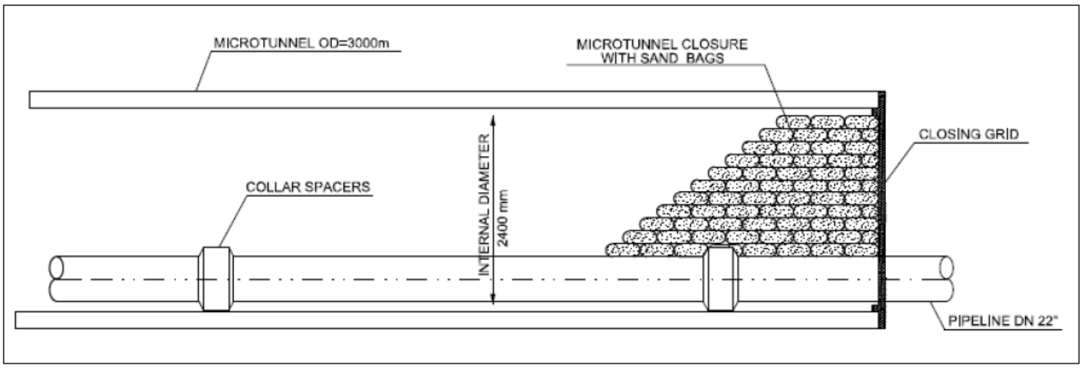


Figure 40: Schematic diagram of closure at subsea end of the proposed MTT section

The landward side of the transition pit swath ('the drill punch-out') is located at a depth of 44.9m, which does not support *Posidonia oceanica* nor *Cymodocea nodosa* meadows and is mainly characterised by rocky seabed colonised by the sciaphilic alga *Flabellia petiolata* and stretches of unvegetated fine sediment. Despite this, the distance between the landward/shallow extremity of the excavated pit and the current distribution of seagrass meadows in the area is in the order of hundreds of meters, rendering the same meadows subject to typical impacts arising from such excavations, including regression due to siltation (due to changes in sediment budgets), smothering and reduction in photosynthetic efficiency. The fact that the sediment within this unvegetated stretches is characterised by fine grain sizes (mainly SILT, as evident from Table 10 below) makes the probability of such an impact materialising even higher. The benthic assemblages, including macrofaunal anthozoan, echinoid and poriferan species of high conservation importance, characterising the seabed swath to be excavated will be irreversibly obliterated.

Table 10: Summary of grain-size properties of the various pipeline route swathes

KP (m)		Thickness	Surficial Soil		γ'	w	Su	Dr	ϕ	Samples	CPT
from	to										
(m)	(m)	(m)	Soil Type	Consistency/Density	(kN/m3]	(%)	kPa	(%)	(°)		
12600	17000	0-1.5	SILT	extremely soft	5.8-7.0	55-70	2.3+1z	-	-	MEW001B_K01-K02	C01
17000	44000	0-8	CLAY	extremely soft	5-6.5	65-85	2+1.8z	-	-	MEW001B_K03-K13	C02-C07
44000	50000	0-3.5	CLAY	extremely soft	5-6.5	65-85	2+1.8z	-	-	MEW001B_K14	C08
50000	52000	0-0.35	SAND	loose	8.5	25	-	15-35	28-30+	MEW001B_K16	C09
52000	55000	0-1.75	SILT	extremely soft	6.0-9.0	35-65	8+2.7z	-	-	MEW001B_K17	
55000	63500	0-4	CLAY	extremely soft	5-6.5	60-80	4+2.5z	-	-	MEW001B_K18-K21	C10, C11
63500	71500	0-4.5	CLAY	extremely soft	5-6.5	60-80	4+2.5z	-	-	MEW001B_K22-K24	C12
71500	76000	0-3	CLAY	extremely soft	5-6.5	60-80	4+2.5z	-	-	MEW001B_K25-K26	C13
76000	87000	0-10	SILT	extremely soft	6.0-9.0	35-65	8+2.7z	-	-	MEW001B_K27-K30	C14, C15
87000	103000	0-0.5	SILT/SAND	Medium dense	7.7-9	25-35	-	30-60	30-36+	MEW001B_K31-K36	C16-C18
103000	113000	0-0.5	SILT/SAND	Medium dense	7.7-9	25-35	-	30-60	30-36+	MEW001B_K37-41	C19-C21
113000	119000	0-0.8	SILT	Loose to medium dense	6.5-10	28-60	-	20-60	29-36+	MEW001B_K42-K43	C22
119000	126000	0-0.5	SAND	Loose to medium dense	6.5-10	28-60	-	20-60	29-36+	MEW001B_K44-K46	C23
126000	137000	0-0.5	CLAY	extremely soft	5.8-8	43-72	5+10z	-	-	MEW001B_K47-K51	C24, C25
137000	138500	0-0.8	SAND	Loose to medium dense	9.6	23	-	20-40	29-31+	MEW001B_K52	C26
138500	156500	0-0.8	SILT	Medium dense	7.5-8.3	33-45	-	30-60	30-36+	MEW001B_K53-K59	C27-C30
156500	158.911	0-0.5	SAND	Medium dense	7.0-8.0	15-38	-	40-60*	31-36+	MEW001B_K60	

Anchoring impacts on sensitive benthic assemblages are expected to arise from the following typologies of vessels which have been identified for deployment during the construction phase:

- Jack-up platform for offshore assistance to drilling
- Backhoe or cutter section trailing dredger, split hopper barges, multipurpose vessel, crew vessel for offshore trenching works
- Maxi drilling rig, crew vessel, support vessel, crawler crane, multi-cat equipped with crane, and submersible mud pump for drilling operations

A crane barge, coupled with intervening SCUBA divers, is expected to be deployed once the MT trenchless phase has been completed in order to enable recovery of the TBM, with such a barge expected to exert a considerable impact on nearshore benthic communities.

The benthic footprint to be impinged upon by such anchoring activities is expected to be higher than for conventional anchors given that:

(i) Most probably, the deployment of anchor stabilisers will also be requested/needed (Worzky, 2009) and
(ii) The mooring corridor is larger than laying corridor and significantly depends on encountered water depth; it can be typically estimated in a width of 1,000-1,500m approx. beside the route corridor axis.

The direct (hits, scour) and indirect (crabbing, for example) impacts of anchoring on seagrass meadows (e.g. Milazzo et al., 2004) and on other sensitive benthic assemblages is well-known. For instance, as in the case of seagrass beds, besides obliteration of flora and fauna through direct physical damage, anchoring on infralittoral and circalittoral habitats affects the associated fauna, particularly sessile species, through alteration of habitat structure, reduced primary production and changes to trophic relationships (García Charton et al., 2000).

4.1.2.5 Nearshore: Noise and vibration impacts

Anthropogenic noise and vibration can be produced during route clearance, trenching and backfilling, pipeline and pipeline protection introduction by the vessels and tools used during these operations.

Vibrations transmitted from tunnelling works could potentially impact the breeding population of the Short Toed Lark (*Calandrella brachydactyla*) especially if these coincide with their breeding season. If these works are planned outside the breeding season such impacts should be easily avoided. Nevertheless, the EIA vibration report for the project reveals that the maximum predicted vibration level is $0.32 mms^{-1}$ on the Delimara peninsula based on the assumption of micro tunneling being implemented at the onshore landing operational area. This implies that a significant vibration effect is unlikely to occur during the micro tunnelling process.

Intensity and propagation of underwater noise will vary according to bathymetry, sea-floor characteristics (e.g., sediment type and topography), vessels and machines used, and water column properties. Nedwell & Howell (2004) examined the noise produced by plough trenching in a sandy gravel area for the installation of an electric cable within a Welsh offshore wind farm. Results showed a maximal noise emission of 178 dB re 1µPa (on a frequency range from 0.7 to 50 kHz) at 1 m from the trenching area. A similar study by Bald et al. (2010) focused on noise from trenching and cable installation of a wind-farm platform in a sandy area in the Bay of Biscay. During the installation phase, average sound level was 188.5 dB re 1µPa (at 11 kHz) at 1 m from the source. Modelling using these in situ data estimated that the underwater noise would remain above 120 dB re 1µPa in an area of 400 km^2 around the source.

According to Taormina et al. (2018), there is no clear evidence that underwater noises emitted during pipeline installation affect marine mammals or any other marine animal, although it is accepted that many marine animals (notably mammals and fishes) detect and emit sounds for different purposes such as communication, orientation or feeding. Marine mammals have high frequency functional hearing ranges from 10 Hz to 200 kHz, while fish typically hear at much lower frequencies, often from 15 Hz to 1 kHz. Other taxa, organisms including sea turtles, and many invertebrates such as decapods, cephalopods, or cnidarians, have also been shown to be sound-sensitive. Many studies high-light the reaction of cetaceans to anthropogenic sounds of different intensities. Sounds generated by ship activity can impact the behaviour of different fish species. Anthropogenic underwater noise can affect marine life in different ways, by inducing species to avoid areas, disrupting feeding, breeding or migratory behaviour, masking communication and even causing animal death. So far, characterisation of acoustic thresholds causing temporary or permanent physical damage are much better described for marine mammals than for fish, and remain unknown for marine invertebrates and sea turtles. Compared with other anthropogenic sources of noise, such as sonar, piling or explosions, underwater noise linked to undersea pipelines remain low. Pipeline laying is a spatially localised temporary event, so that the impact of noise on marine communities is expected to be minor and brief.

Detailed noise studies presented in the Environmental Impact Assessment reports of the proposed scheme have predicted the following impacts:

- Onshore construction works are unlikely to exceed the set thresholds as defined in BS5228-1:2009+A1:2014 at any of the identified onshore noise sensitive receptors.
- Detailed underwater noise modelling prediction and assessment results demonstrate that noise emissions from all identified construction and operation activities associated with the proposed pipeline development are predicted to have low physiological impact, particularly in regard to the PTS impact, for assessed marine fauna species. Among all identified activities, noise emissions from the pipe-laying barge operation are predicted to have the highest adverse noise impact, particularly for low frequency cetaceans such as the common minke whale & fin whale, even if this is listed as minor/minimum in the EIA noise assessment study.

4.1.2.6 Nearshore: Discharge of drilling fluids

The drilling mud has physical characteristics designed to preserve the integrity of the drilled hole, remove cuttings, and lubricate the bit and the down-hole tools, besides ensuring an exclusively hydraulic seal. Generally, the mud is an inert substance containing a mixture of water, Bentonite and an organic colloid added to provide the necessary viscosity and filtration properties to the slurry (additive like “Tunnel-GEL SW” or “Bore-GEL” by Baroid or similar product may be used for this scope).

The total volume of mud necessary and the dispersion of drilling fluids mainly depend on the selected procedure The contractor has preferred the MT technique over the HDD one, and this constitutes a much-lower anticipated volume of discharged drilling muds given that, during the progress of the microtunnel, the sludge is recovered through an internal piping system and, with an adequate layer of soil above the tunnel, the dispersion of the same muds into the sea is reduced.

The water consumption, mainly used for the transport of the excavated soil in the water-based slurry, is estimated in the order of 3600 to 8000m^3, with such a high level of uncertainty arising from the state of the particular soil conditions and potential losses of slurry due to known fracture conditions. This estimate includes the slurry volume and the relatively minor volumes associated with lubrication mud.

The preferred sealing of the subsea section of the excavated microtunnel will involve the placing by SCUBA divers of numerous bags of dry cement at the mouth of the laid structure (Figure 26). It is assumed that the same bags are watertight, such that no cement leakage into the surrounding water will occur, and that the placing of the same bags will not result in spill-over of benthic impacts through shifting of some of the same bags onto a contiguous seabed footprint.

Relatively little research has been conducted to date on the marine ecological impacts of the discard of drilling muds on the marine environment. The few studies which do exist suggest a reduction in the macrofaunal biodiversity asset within discharge points, also due to a proliferation in opportunistic, low-conservation species (e.g. Denoyelle et al., 2010).

4.1.2.7 Offshore impacts

In offshore areas, further works might be necessary along additional stretches of the pipeline route in association with:

- Protection of existing pipeline or cables in connection with crossings;
- Reduction of free span heights to reduce the forces due to over-trawling. On uneven seafloors, the pipeline may form “free spans” along its route where it will hang without touching the seafloor. This may promote vibration, chafing, fatigue and, ultimately, pipeline failure (Worzyk, 2009). Spans that are unacceptable in the unstressed, air-filled condition must be rectified before installation of the pipeline (pre-lay intervention). Other free span rectification may be postponed until after the pipe string has been laid (post-lay intervention) and thus marine ecological impacts might extend beyond the pipeline-laying phase;
- Smoothing of the pipeline profile to reduce the length of free spans or prevent contact pressures that could damage the coating or dent the pipe steel.

Whilst trenching of the transition pit is the preferred option in nearshore waters, dredging or the deployment of gravel installations or grout bags are the preferred option to remove extensive freespans constituted by outcrops in offshore areas.

The CONSTRUCTION, OPERATION AND MAINTENANCE METHODOLOGY report indicates that the pipeline support at freespan and cable crossing offshore areas will be exclusively conducted through the deployment of extraneous material resting on the seabed, rather than through seabed modification techniques such as dredging and excavation. The current impact assessment exercise took stock of this guidance.

Bulk gravel lowering may be performed by split barges, or through a gravel installation vessel equipped with a fall pipe, as shown in Figure 41 and Figure 42 below.

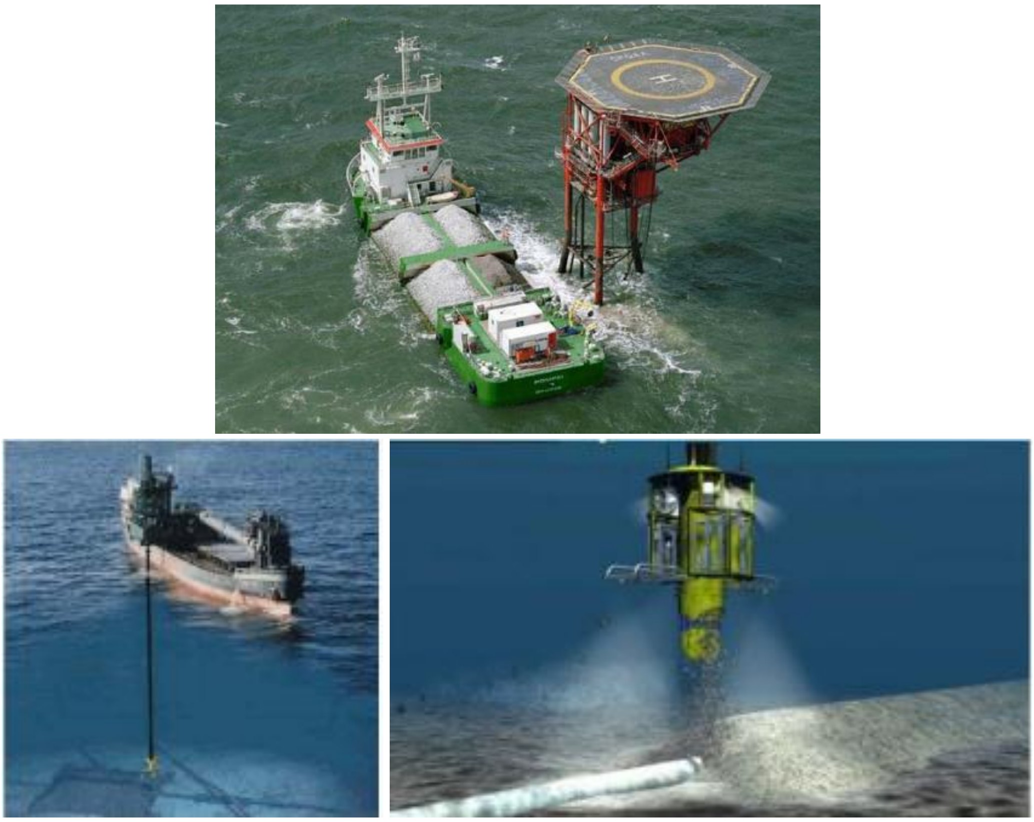


Figure 41: Aspects of different gravel-based pipeline support systems through the fall-pipe technology.

Figure 42: Fabric Formworks – Example of Local Gravel Installation Pipe Support

Isolated gravel berms may be built with few rock bags through a single installation or through multiple installatons via a dedicated frame, as shown in Figure 43 below, and this technique is preferred since it allows the placement of material over the seabed with great accuracy, thus reducing the probability of impact spill-over over contiguous benthic areas.

Despite marine ecological considerations, the final selection/choice of the applicable technology (bulk or gravel berm) as well as the selected sediment size of the individual stone or gravel particles is very dependent on water depth and amount of materials to be installed, so as to ensure that these will not be removed by wave and current action.

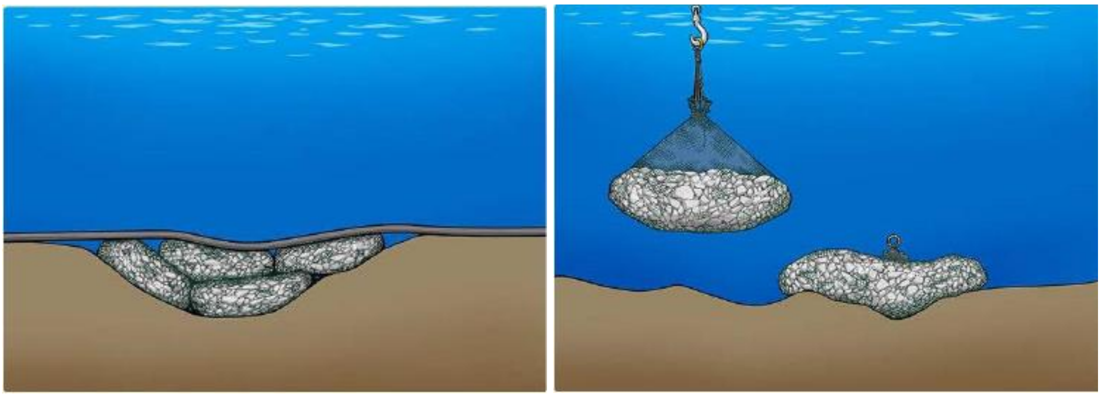


Figure 43: Examples of different pipeline support rock filler units.

Pre-lay free span supports will have to be made sufficiently wide to cater for the pipelay tolerance as well as the horizontal tolerance on gravel installation, which is greater when the gravel berm cannot be related to a fixed object (e.g. the pipeline) on the seabed. Hence, pre-lay installations are expected to impinge on a larger benthic footprint that post-lay interventions.

The benthic impact of the various pipeline support technologies to counteract freespan areas will entail the detachment and obliteration of sessile, erect, rigid macrofaunal individuals and colonies falling directly within the footprint of the free-span being addressed. Localised enhanced scouring around the margins of the seabed intervention area might also result in a small-scale sediment budget change, with the accumulation and erosion of benthic sediment in alternate mobile sediment areas. Within project description documents, there is an indication of where such free-spans might be addressed through the deployment of five mattresses – approximately KP 137 to KP 151 where the seabed is characterised by a complex heterogeneity. It has emerged through the marine baseline surveys that the same stretch supports benthic communities of conservation importance, mainly settled on rocky outcrops.

It may also be necessary to establish lateral supports (counteracts) to guide the pipeline in the horizontal plane to achieve the desired curved lay radius if the lateral soil friction is evaluated insufficient in combination with on-bottom residual lay tension. Rather than gravel berms, such counteracts may take the form of structural elements that can be retrieved and reused. This kind of occurrence should be evaluated in the Malta nearshore from KP 148.100 and KP 155.884 approximately.

To avoid damage to any of the existing cables lying on the seabed, crossing infrastructures should be separated by a suitable material. In addition, the pipe lay corridor in the concerned area will be reduced to ±2.5m in order to reduce as much as possible the dimension of the intervention work to be carried out. At cable crossings, two different scenarios exist:

(i) Existing cable is trenched into the seabed – pipeline can simply be placed on top of it, but would itself need surface protection;

(ii) Existing cable lies on the seabed and cannot be tampered with; it is necessary then to engineer a crossing using rock berms, mattresses, grout bags or similar, so the new pipeline can be laid across without damage to the existing cable, and the entire crossing covered, if required.

To meet the above requirements, some pre-lay works would be necessary and in particular the installation of some mattresses very close to the crossing to achieve the proper gap between the pipeline with existing facility. Flexible bitumen mattresses are typically used for such task, installed as shown in Figure 44.

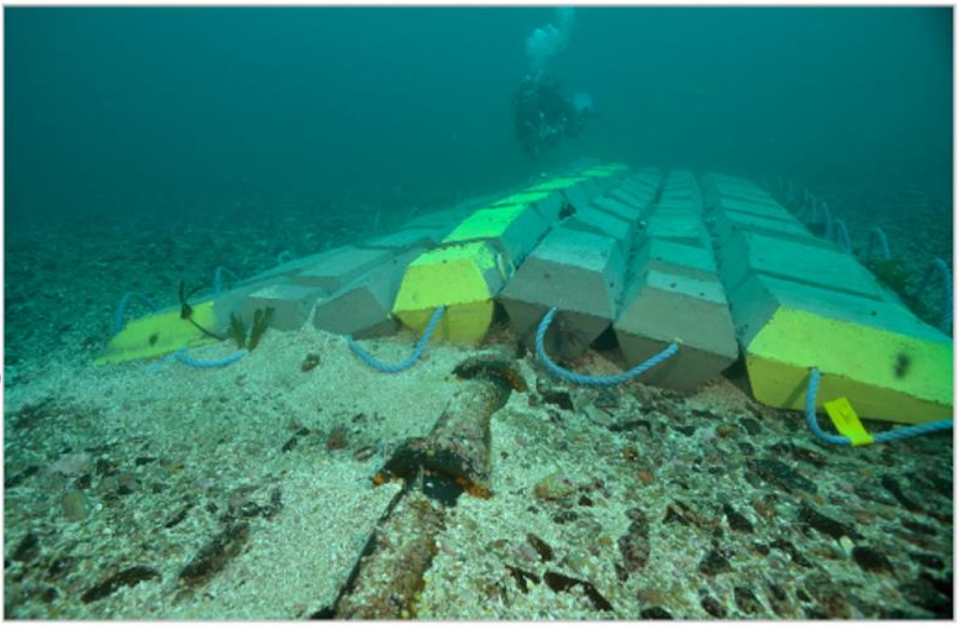


Figure 44: Iron shells and a concrete 'mattress' used to protect an unburied cable at a French tidal turbine test site.

Marine ecological impacts through such works will arise mainly through the seabed footprint impinged upon through the laying of the cable crossing features, which will obliterate and smother benthic assemblages falling directly within their footprint. Most of the recorded cable crossings are in offshore waters characterised by fine sediment stretches. As a result, besides the direct impact ons sensitive benthic assemblages, one can also expect an indirect impact through the re-suspension of fine particulates in the water column through the proposed seabed interventions.

Localised covering of the pipeline may be required, for example, to protect against dropped objects at platforms, or to prevent scour in the vicinity of platform legs or other structures on the seabed. In such cases, a structural cover is an alternative to the deposition of rocks on the seabed for structure protection purposes. The engineered covering may be constituted by structural concrete elements placed over the pipeline, built up by flexible mattresses manufactured from geotextile, bitumen and aggregate or from interlocked concrete blocks. Also sand bags or grout bags placed by divers may be used (Braestrup et al., 2009).

Like all other offshore operations, pipelaying is weather dependent, and the tolerance depends upon the type and size of the pipelaying vessel and its tensioning capacity in respect of the pipeline sizing. At a certain sea state, it becomes impossible to add more pipe to the string, which is then kept under constant tension by the tensioners. Pipelaying will also have to be suspended if the weather prevents either the tugboats from relocating the anchors, or the supply vessels from docking at the laybarge to transfer pipe or essential supplies. If the movements of the laybarge become so large that they may endanger the integrity of the pipeline, the pipe string will have to be temporarily abandoned. A laydown head with an attached cable is welded on to the pipe string, which is lowered to the seabed under tension.

At the return of calm weather, the pipe string is winched aboard the laybarge, secured by the tensioners, the laydown head removed, and pipelaying resumed. The marine ecological impacts of such a procedure would be restricted to the benthic area impinged upon by the temporarily abandoned pipeline laydown head as well as of anchors and associated anchor stability structures of the servicing vessels.

4.1.3 Operational phase

The main activities relevant to the project which are envisaged to lead to substantial marine ecology impacts during the Operational Phase are the following:

- Benthic impacts from servicing vessels (e.g. for exercises involving pipeline repairs or regular monitoring of the pipeline's integrity/structure)
- Benthic impacts arising directly from pipeline maintenance and repair works
- Anthropogenic generation of submarine noise during pipeline maintenance and repair works

Given the preference for sacrificial anodes over the application of an impressed current as a corrosion-inhibiting feature, no significant electromagnetic field (EMF) generation is expected to be generated as a result of the pipeline's operations.

4.1.3.1 Impact from servicing vessels

Anticipated anchoring impacts are described in detail in the Construction Phase impacts section. Pipeline maintenance and repair works could entail the following activities:

- Replacing a pipe rupture
- Repairing a pipe leak
- Repairing corrosion pitting
- Repairing anticorrosion coating
- Replacing a pipe pup or a pipeline section damaged by Third party

which would impinge on the seabed through associated welding, excavation, field coating and other activities which extend beyond impacts related to anchoring. Anthropogenic generation of submarine noise impacts are expected to be of the same nature as those arising during the Construction Phase but are expected to be of a lower significance given the pulse/episodal nature of noise generation during the Operational Phase associated with stochastic pipeline maintenance and repair works.

4.1.3.2 Fouling organisms on artificial structures

As with any other artificial structure placed in the sea, the pipeline's non-submerged surface area will eventually be colonised by fouling organisms. Whilst some of these fouling species are of an opportunistic, cosmopolitan nature, thus holding a low conservation value (even representing a novel introduction pathway for non-indigenous species in some cases), a number of high conservation importance fouling species can also colonise the pipeline. This phenomenon has been recorded for numerous submerged cables and pipelines resting on the seabed (Taormina et al., 2018).

4.1.4 Decommissioning phase

The proposed pipeline has an anticipated lifetime of 35 years, after which the pipeline infrastructure might be partly (onshore sections only, given that the recovery of offshore sections of the pipeline is not deemed feasible) recovered, with an array of marine ecological impacts which are similar to the construction phase ones arising or completely discarded. In the second scenario, marine ecological impacts are basically neutralised.

4.1.5 Summary of impacts

Table 11 postulates the degree of significance of anticipated marine ecology impacts that the proposed development will have on protected species and habitats recorded within the AoI, as described below:

- Significant (S) impact = if postulated impact will directly impinge on the conservation status of the protected species or habitat within the entire surveyed area; or make the achievement of the conservation objectives for any impacted Natura 2000 site less likely;
- Not significant (NS) impact = if postulated impact will not directly impinge on the conservation status of the protected species or habitat within the entire surveyed area; or not affect the achievement of the conservation objectives for any impacted Natura 2000 site.

Table 11: Summary of marine ecological impacts on protected species and habitats

Protected species or habitat	Project human activities leading to putative marine ecological impacts									
	Excavation of pre-trenched transition zone	Land reclamation	Installation of pipeline supporting structures	Installation of pipeline cable crossing features	Benthic impacts from servicing vessels	Abandonment and recovery of pipeline during rough weather	Release of large volumes of wash water during hydrotesting	Release of drilling fluids	Underwater noise during seabed interventions	Generation of electromagnetic field
Species/Habitats										
Cystoseira cfr. *brachycarpa*[7]	S	NS	NS	NS	NS	NS	NS	NS	NS	NS
Posidonia oceanica	S	NS	NS	NS	NS	NS	NS	NS	NS	NS
Cymodocea nodosa	S	NS	NS	NS	NS	NS	NS	NS	NS	NS
Lithothamnion minervae and *Lithothamnion corallioides*	NS	NS	S	NS	NS	NS	NS	NS	NS	NS
Ophidiaster ophidianus	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Centrostephanus longispinus	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

[7] *Given the notoriously difficult taxonomic identification of different Cystoseira species, especially through the sole use of ROV footage, caution is being exercised here*

Protected species or habitat	Project human activities leading to putative marine ecological impacts									
	Excavation of pre-trenched transition zone	Land reclamation	Installation of pipeline supporting structures	Installation of pipeline cable crossing features	Benthic impacts from servicing vessels	Abandonment and recovery of pipeline during rough weather	Release of large volumes of wash water during hydrotesting	Release of drilling fluids	Underwater noise during seabed interventions	Generation of electromagnetic field
Palinurus elephas	NS	NS	NS	NS	NS	NS	NS	NS	S	NS
Eunicella cavolinii	NS	NS	S	S	NS	NS	NS	NS	NS	NS
Antipathes dichotoma	NS	NS	S	S	NS	NS	NS	NS	NS	NS
Axinella polypoides	NS	NS	S	S	NS	NS	NS	NS	NS	NS
Habitats										
P. oceanica meadows	S	NS	NS	NS	S	NS	NS	NS	NS	NS
C. nodosa meadows	S	NS	NS	NS	S	NS	NS	NS	NS	NS
Reefs *(recorded as biogenic reefs)*	NS	NS	S	S	NS	NS	NS	NS	NS	NS

4.2 Avian Study

4.2.1 Impact Significance

The impact assessment criteria that will be used to assess the identified avian ecological impacts are provided in the tables below.

Duration of Impact	
Permanent	Impact would still be detectable following decommissioning of project
Temporary	Impact would persist throughout the phase of project under consideration only

Extent of Impact	
Widespread	Impact is expected to affect in the entire area of study and/or may extend beyond the boundaries of direct intervention into adjacent areas
Localised	Impact is expected to affect receptors in the immediate vicinity of its source

Consequences of Impact	
Direct	Changes that result from the cause-effect consequences of interactions between the environment and project activities
Indirect	Changes that result from cause-effect consequences of interactions between the environment and direct impacts

Effect of Impact	
Adverse	A negative effect on the sustainability of the resource under consideration, which are distinguishable from background fluctuations
Beneficial	A positive effect on the sustainability of the resource under consideration, which are distinguishable from background fluctuations

Reversibility of Impact

Reversible	The state of the resource is expected to return to baseline state following cessation of the source of impact
Irreversible	The state of the resource is not expected to return to baseline state following cessation of the source of impact

Sensitivity of resources to impact	
Major	The resource under consideration is highly susceptible to a detectable deviation from the background state and its general dynamics
Moderate	The resource under consideration is vulnerable but able to tolerate a degree of detectable deviation from the background state and its general dynamics
Low	The resource under consideration is highly tolerant to a detectable deviation from the background state and its general dynamics

Probability of Impact Occurring	
Definite	Impact will occur irrespective of any mitigation measures taken
Likely	Impact may occur despite the implementation of mitigation measures
Unlikely	Impact would only occur in cases of major mitigation failure

Impact Significance	
Significant	Will affect keystone and/or protected species and/or habitats
Not Significant	Will not affect any keystone and/or protected species and/or habitats

Residual Impact	
Major	The effect on the existing state of the feature under consideration will lead to a high or large-scale change in its resilience after application of mitigation measures (if any) and impact cessation
Moderate	The effect of the existing state of the feature under consideration will lead to an observable but contextually restricted change, which is sufficiently important for its long-term resilience after application of mitigation measures (if any) and impact cessation

Minor	The effect on the existing state of the feature under consideration will lead to no, low or small-scale change that will not alter its resilience after application of mitigation measures (if any) and impact cessation

4.2.2 Construction phase

4.2.2.1 Silting of water column from drilling / construction works

The connection of the pipeline to land will be via a connection hole at a depth of around 42m below sea level and about 600m offshore. This location would be within the Marine Protected Area *Żona fill-Baħar fil-Lbiċ* and close to the adjacent one known as *Żona fil-Baħar fil-Lvant* so any siltation of the water column resulting from sediments arising from rock excavation, dredging, cement and rehabilitation works could affect these two protected sites. Sea water currents in the area will quickly diffuse these sediments in directions depending on the prevailing currents at the time. Hence it is difficult to identify the consequential effects resulting from such works. Sedimentation of the water column with the potential of some contamination resulting from same works could have an effect on the organisms in the water column, including plankton and fish which are food for seabirds in the area.

Contamination of the food sources could have a significant effect on the recipient species be they adults or fledglings albeit in the latter case the consequences could be highly significant.

Precautionary measures should be undertaken in order to prevent the use of any toxic materials used in cements or other products which could prove toxic to aquatic life.

Special care should be undertaken in order to reduce the possibility to avoid the spread of sediments away from the working areas. This would reduce the impacts and avoid affecting the respective protected avifauna in the surroundings.

Disturbance of existing sediments from the bottom of the sea should not have any particular effect albeit the visual effect might look alarming due to the potential extent. Usually, it is the fine material which would take long to settle rather than the large pieces which would settle in the immediate vicinity. Disturbance of sediments could also result in the attraction of fish and surfacing this attracting various species of birds, usually gulls, but other protected species could also be attracted, hence the importance to avoid toxic chemicals. The intoxication of any species irrespective of its protection status is always a negative impact on the species, the higher the protection status, the higher the significance.

4.2.2.2 Noise from working vessels

Work on the vessels will take place during day and night. The working area will change depending on the part where the pipe laying would be taking place. The procedure will follow through a pathway which crosses three main Marine Protected Areas, namely *Żona fil-Baħar fil-Lvant*, *Żona fil-Baħar fil-Lbiċ* and *Żona fil-Baħar fil-Grigal*. The three sites are known to be used to a different extent by the Yelkouan Shearwater, Scopoli's Shearwater and the Storm Petrel as rafting site and also as feeding areas.

The noise emanating from these vessels will definitely have a negative impact on all these species when these are found in the respective zones which are normally used by these birds. It would displace them from these areas albeit in a temporary manner. However, this displacement would much depend on whether the species would be present during the same time these birds would be around our shores.

The adults of the Yelkouan Shearwater are mainly seen offshore from December to July albeit small numbers are seen during the shoulder months. Birds fledge between mid-June and July.

The adults of the Scopoli's Shearwater start visiting their nests in February, whereas, in this case the offspring fledge by the end of October.

Both species utilize practically similar resources and in order to partition such resources they have adapted slightly different breeding timetables, hence allowing both to live practically together with reduced competition between them (Figure 45).

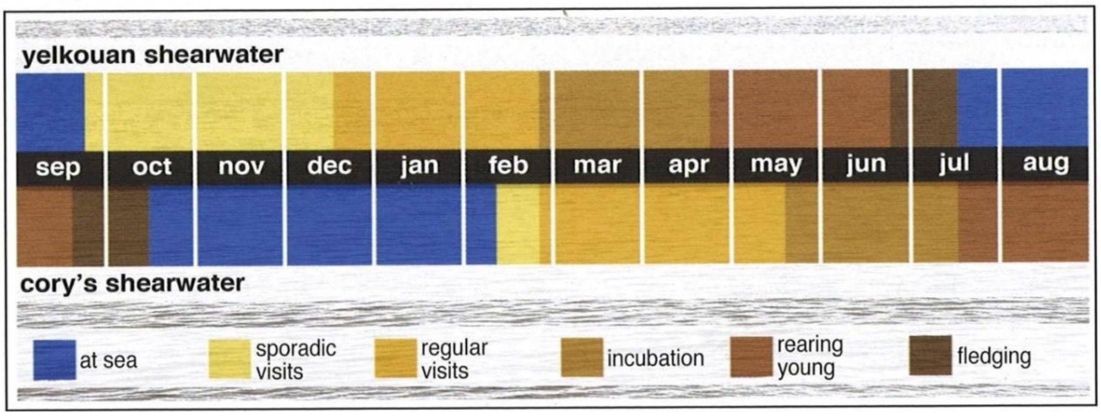


Figure 45: Comparison of the annual cycles of the Yelkouan and the Scopoli's (Cory's) Shearwater (Sultana et al, 2011)

The Storm Petrel returns to its breeding grounds around mid-February and would have left by end of October. During this period there are two breeding cycles, one between mid-April and mid-July and a second one between mid-July and late October.

The impact significance resulting from the noise could have on the above species would much depend on the period when the work would be carried out and also on the level of disturbance on the species. The precautionary principle has been used to formulate this assessment. This implies that the level of noise is high enough as to cause displacement of the species from the rafting / food gathering areas especially if this is taking place during the breeding period where the adults are actively seeking food resources for their offspring. The displacement would entail that they would have to spend more energy to gather the same resources. This could impact of the success of their offspring. However, the impact is transitionary and should only last for a period ranging from a few weeks to a few months depending on the progress of works being registered at the time.

Pipe laying is scheduled to take place between March 2023 and September 2023 starting off from the Malta end. This implies that it would coincide with the breeding period of all the three species. This could have a significant impact on the species.

Nevertheless, noise studies presented in the Environmental Impact Assessment reports for the proposed scheme establish a minimum distance to comply with the AQTAG09 noise level of 55dB $L_{Aeq,1hr}$, an index used to establish the significance of noise impacts on avifauna (Table 12). The minimum buffer distance from the source of noise varies with the construction phase.

Table 12: Predicted Minimum Distance to Comply with AQTAG9 - LAeq,1hr 55 dB

Construction phase	**Cardinal direction**			
	North	**South**	**East**	**West**
Phase 1	215m	158m	117m	250m
Phase 2	140m	155m	66m	151m
Phase 3	445m	328m	215m	443m
Phase 4	249m	245m	125m	258m

The study reveals that the nearest SPAs and/or bird sanctuaries are located at distances which are greater than 300m away from the proposed onshore construction activities. Therefore, onshore construction activities are unlikely to have a significant adverse noise impact on the known bird populations within these areas.

4.2.2.3 Illumination of working vessels and immediate surroundings

Illumination is one of the most contentious issues with regards to nocturnal species especially, both species of Shearwater and the Storm Petrel. Their offspring are disoriented by light and during their first flights, they just head towards sources of light and so either get lost or injured. Adults do not visit their nests if there is light in the proximity of their nesting sites or in the presence of the moon. So lights on working vessels close to shore could have a negative impact of the species, especially the Yelkouan and the Scopoli's Shearwater since their breeding grounds are very close to the Scheme and they use part of the protected area when they are using their nests. The impact should be to a lesser extent on the activities of the Storm Petrel since their major breeding ground is on *Filfla* which is relatively far away from the Scheme, albeit six birds were recovered from coastal areas in the proximity of the Scheme (Sultana et al, 2011). The proposed schedule of works for offshore pipe laying is between March 2023 and September 2023 starting off from the Malta side. This coincides with the breeding period of the three species. It is unlikely that works would still be taking place when the offspring fledge so there shouldn't be any major impact on any of the offspring of species since the vessels should be a significant distance offshore when the young birds fledge. However, there could be some impact on the adults prior to reach their nests.

4.2.3 Operational phase

4.2.3.1 Illumination of the site

Once the construction phase is over, there shouldn't be any resulting impacts from the presence of the gas pipeline below sea level since there should not be any presence of permanent light feature indicating its route.

The only permanent area which would remain evident on land is the Terminal Plant which would be in *Marsaxlokk* Bay next to the pier currently used by the FSU.

One scenario for the resulting effect of the project would be the removal of the FSU tanker from the bay. The effect from lights resulting from this source would be removed and the impact resulting from it would be nullified. The proposed terminal is further inland and much smaller in size than the FSU tanker but would still have some lighting fixtures installed, details of which are not yet available. It is being assumed that the quality of light dispersion from this area would be reduced as a result of the new facility. So in this case, there should be a positive impact on the avian species when compared to current levels, albeit the available light in the area would still have a negative impact but to a lower degree when compared to current levels.

A second scenario is that the FSU would remain in place and the terminal would be an addition on site. Lights from the new Terminal facility should have an additional effect albeit minor to that from the FSU facility. The net result would be a slight increase over and above the current impacts.

4.2.4 Decommissioning phase

It is planned that once the pipeline ceases operation, the equipment (valves, meters, heaters, etc) in the plant in the terminals at Gela and Malta are removed and appropriately disposed of according to all local legislation and guidelines. However, the offshore pipeline, being a carrier of uncontaminated sweet gas, will probably be left on the seabed since the process to remove the pipeline from the bottom is expected to have a higher environmental impact than keeping it in its installed place. Nonetheless, this is subject to decisions taken by the relevant Authorities at the time of decommissioning. If the pipeline is removed, the impacts are expected to be of a similar nature to those postulated to arise during the Construction phase, with the additional impact that any marine life, bioconstructions and fauna thriving on the pipeline and in areas where protection is envisaged will be depleted from the colonised area.

4.3 Summary of impacts

The following ecological impacts have been identified for both the construction and operational phases:

- Silting of water column from drilling / construction works;
- Noise from working vessels;
- Illumination of working vessels and immediate surroundings;
- Illumination of Terminal area

A detailed summary of impacts is provided in Table 13.

Table 13: Summary of impacts table

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	**Specific intervention leading to impact**	**Project phase (construction/ operation/ decommissioning)**	**Receptor type**	**Sensitivity & resilience toward impact**	**Direct/ Indirect/ Cumulative**	**Beneficial/ Adverse**	**Severity**	**Physical/ geographic extent of impact**	**Short-/ Medium-/ Long-term**	**Temporary (indicate duration) / Permanent**	**Reversible (indicate ease of reversibility)/ Irreversible**					
Obliteration of benthic assemblages	Seabed reclamation	Construction	Benthic assemblages	Moderate	Direct	Adverse	Moderate	Local/Restricted	Long-term	Permanent	Irreversible	Inevitable	Significant	Size of the reclamation area has already been minimised as much as possible	Major	N/A
Obliteration of benthic assemblages	Transition pit (including associated dredging)	Construction	Benthic assemblages	High	Direct	Adverse	High	Moderate extent	Medium-term	Permanent	Irreversible	Inevitable	Significant	Size of the excavation pit has already been minimised as much as possible	Major	N/A
Obliteration of benthic assemblages	Pipe-laying within the identified corridor	Construction	Benthic assemblages	High	Direct	Adverse	High	Widespread	Long-term	Permanent	Irreversible	Inevitable	Significant	Pipeline route has already minimised this as much as possible	Major	N/A
Obliteration of benthic assemblages	Heightened anchoring activity	Construction	Benthic assemblages	High	Direct	Adverse	High	Local/Restricted	Long-term	Permanent	Irreversible	Inevitable	Insignificant	Use of anchor stabilisation devices should be minimised	Minor	N/A
Atmospheric fall-out/ deposition of fine particulates	Various works	Construction	Marine organisms and habitats	Low	Indirect	Adverse	Low	Moderate extent	Short-term	Temporary	Reversible	Likely	Insignificant	Use of dust mitigation techniques	Minor	Monitoring
Heightened marine contamination risk	Accidental release of fuels, lubricant oils, additives, etc	Construction	Marine organisms and habitats	Low	Indirect	Adverse	Low	Moderate extent	Short-term	Temporary	Reversible	Likely	Insignificant	Use of appropriate bunding, spill kits and booms	Minor	Monitoring
Re-mobilisation of nutrients and	Various works	Construction	Marine organisms and habitats	Moderate	Indirect	Adverse	Moderate	Widespread	Short-term	Temporary	Reversible	Likely	Insignificant	N/A	Moderate	N/A

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase (construction/ operation/ decommissioning)	Receptor type	Sensitivity & resilience toward impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ geographic extent of impact	Short-/ Medium-/ Long-term	Temporary (indicate duration) / Permanent	Reversible (indicate ease of reversibility)/ Irreversible					
pollutants sequestered within the benthic sediment																
Re-suspension of fine benthic sediment fractions	Dredging works	Construction	Marine organisms and habitats	Moderate	Direct	Adverse	Moderate	Widespread	Short-term	Temporary	Reversible	Inevitable	Insignificant	Deployment of geotextile silt curtain	Minor	Monitoring
Installation of pipeline support structures	Pipe-laying within the identified corridor	Construction	Benthic assemblages	High	Direct	Adverse	High	Widespread	Short-term	Permanent	Irreversible	Inevitable	Significant	Size of structures should be minimised	Major	N/A
Installation of cable crossing structures	Pipe-laying within the identified corridor	Construction	Benthic assemblages	High	Direct	Adverse	High	Moderate	Short-term	Permanent	Irreversible	Inevitable	Significant	Size of structures should be minimised	Major	N/A
Release of drilling fluids into the marine environment	Post-lay works	Construction	Marine organisms and habitats	Moderate	Direct	Adverse	Moderate	Moderate	Short-term	Temporary	Reversible	Inevitable	Significant	Drilling muds should be recovered as much as possible and with microtunnelling they are reduced to a minimum.	Minor	N/A
Anthropogenic generation of submarine noise	Various works	Construction	Marine organisms and habitats	Moderate	Indirect	Adverse	Moderate	Widespread	Short-term	Temporary	Reversible	Inevitable	Significant	Deployment of air bubble screens for stretches with high noise generation (such as trenching)	Minor	N/A
Silting of water column	Drilling and construction works	Construction	Avian	Moderate	Indirect	Adverse	Could be high	Could be widespread	Short term	Temporary	Reversible	Likely	Significant	Good working management practices; use of silt curtains;	Minor	

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase (construction/ operation/ decommissioning)	Receptor type	Sensitivity & resilience toward impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ geographic extent of impact	Short-/ Medium-/ Long-term	Temporary (indicate duration)/ Permanent	Reversible (indicate ease of reversibility)/ Irreversible					
														Avoid use of toxic chemicals in cements, binders etc.		
Noise	Machines/ engines etc.	Construction	Avian	Moderate	Direct	Adverse	Could be high	Could be widespread	Short term	Temporary	Reversible	Likely	Significant	Good working management practices; use mufflers; Set maximum operational noise threshold levels;	Minor	
Illumination	Working vessels and terminal	Construction	Avian	High protected species	Direct	Adverse	High	Could be widespread	Short term	Temporary	Reversible	Likely	Significant	Limit number of working vessels at night and illumination levels on vessels	Moderate	
Heightened marine contamination risk	Increase in marine traffic in the area	Operation	Marine organisms and habitats	Low	Indirect	Adverse	Low	Moderate extent	Short-term	Temporary	Reversible	Likely	Insignificant	N/A	Minor	N/A
Benthic impacts	Pipeline maintenance and repair works	Operation	Benthic assemblages	High	Direct	Adverse	High	Widespread	Long-term	Permanent	Irreversible	Inevitable	Significant	Use of anchor stabilisation devices should be minimised	Moderate	N/A
Anthropogenic generation of submarine noise	Maintenance/ repair	Operation	Marine organisms and habitats	Moderate	Indirect	Adverse	Moderate	Moderate extent	Short-term	Temporary	Reversible	Inevitable	Significant	Deployment of air bubble screens for stretches with high noise generation	Minor	N/A
Colonisation of laid	Laid gas pipeline	Operation	Marine habitats	High	Direct	Beneficial and adverse	High	Widespread	Long-term	Permanent	Reversible	Inevitable	Significant	N/A	Minor	N/A

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	**Specific intervention leading to impact**	**Project phase (construction/ operation/ decommissioning)**	**Receptor type**	**Sensitivity & resilience toward impact**	**Direct/ Indirect/ Cumulative**	**Beneficial/ Adverse**	**Severity**	**Physical/ geographic extent of impact**	**Short-/ Medium-/ Long-term**	**Temporary (indicate duration) / Permanent**	**Reversible (indicate ease of reversibility)/ Irreversible**					
pipeline by epibiota																
Illumination	Terminal facility	Operation	Avian	High protected species	Direct	Adverse	High	Could be widespread	Long term	Permanent	Irreversible	Likely	Significant	Limit the lighting fixtures; position fixtures strategically to reduce glow and light dispersion of light; Consider intelligent lighting solutions	Moderate	
Illumination	Terminal facility plus FSU	Operation	Avian	High protected species	Direct	Adverse	High	Could be widespread	Long term	Permanent	Irreversible	Likely	Significant	Revise lighting on FSU and pier and limit levels of light to basic necessity; consider intelligent lighting solutions	Moderate	

5.0 Mitigation measures

The Scheme cannot really avoid any impacts on the protected areas and species found along its way, however, diligent working practices and mitigation measures could reduce some of the identified impacts.

A possible further re-routing of the pipeline is not being considered as a feasible mitigation measure given (i) the extensive effort invested in selecting the least impactful of pipeline routes and (ii) the technical constraints in prescribing a further change in the pipeline's route at this stage.

5.1 Selection of preferred pipeline support technology

Wherever the need to counter possible pipeline free spans arises, dredging-free pipeline support protocols (i.e. based on gravel and grout bags) should be preferred over those protocols entailing a degree of dredging, so as to minimise impact spill-over over contiguous areas.

5.2 Selection of preferred pre-lay cable crossing technology

The pre-lay cable crossing technology which presents the smallest footprint and thus, presumably, the least direct impact on benthic assemblages, should be selected.

5.3 Recovery of waste drilling muds

This tunneling technique choice implies that the potential dispersal of drilling fluids into the marine environment is of much lower concern given the higher recovery rates involved in the MT.

5.4 Anthropogenic generation of submarine noise

All machinery and equipment used on vessels should employ noise abating technology thus reducing noise pollution and disturbance.

The temporary deployment of air bubble screens should be considered for selected aspects of the project representing the highest generation levels of submarine noise, such as the excavation pit for instance.

5.5 Dispersion of resuspended fine sediment particles

The micro-tunnelling entry point which is farthest away from known seagrass meadows and other sensitive benthic assemblages should be selected for excavation purposes, so as to minimise the probability of regression of the same assemblages through benthic sediment re-suspension and re-settlement which will inevitably arise as a result of the envisaged associated dredging. Such enhanced sediment dynamics are also expected to take place in the nearshore area as a result of the proposed land reclamation activities, and the shallow nature of this area makes the deployment of silt curtain technology feasible as a mitigation measure.

5.6 Siltation of water column

Siltation of the water column can be reduced by suction technologies during excavation works. Waters should be filtered from fine sediment prior to return back to the sea. Excavation works should be limited to periods of good weather. This would reduce the risks of accidents where greatest damage could take place and mitigation measures fail. The utilisation of a sediment curtain around the working area especially during excavation should be explored. This would reduce the dispersal of sediment over large areas.

The works contractor should ensure that no toxic materials are used in cements or materials which could end up dispersed in the waters.

5.7 Targeted anchoring activities

In order to mitigate anchor damage to sensitive benthic assemblages, the use of anchor stabilisation devices should be minimised, in order to reduce the impacted seabed footprint, whilst prior benthic habitat distribution knowledge should be applied in order to avoid, wherever technically feasible, seabed areas supporting such sensitive assemblages. Crabbing (anchor dragging) should be precluded.

5.8 Selection of anti-corrosion inhibitors

In order to improve the performance of the aluminium-based anodic corrosion inhibition system, a small amount of mercury or indium is generally added. The use of indium should be prioritised in this case so as to avoid any discharges of mercury in the marine environment, although there is a very high probability that the hydrotesting stage will not constitute a water quality hazard as this stage will be conducted with inhibitor-free seawater followed by freshwater, such that both types of water can be safely disposed of at sea.

5.9 Trenching protocol

The dimensions of the excavation pit should be kept to a minimum, and the benthic sediment recovered from such an activity should be screened for the occurrence of translocable specimens of species of conservation importance prior to disposal or re-use on site for back-filling.

5.10 Timing of construction works

Works should be concentrated as much as possible to one area rather than having different vessels spread over large areas. This would reduce significantly disturbance to aquatic fauna.

Ideally works at sea close to land along the Malta side should commence late October, albeit one must understand that in terms of climatic conditions this could be the worst time. The greatest impacts on avian species are during the pre-laying period, incubation, rearing of young and fledging. So ideally any operating vessel should be out of the protected zones during those periods otherwise the impacts could be significant.

The problem with commencing works close to shore in October is that this period coincides with the commencement of bad weather conditions which could result in nasty accidents or delay works, thus entering a more sensitive period when the vessels are working within the protected areas.

The latest proposal for offshore works states that these would be between 1st March 2023 and 1st September 2023 starting off from the Malta side. The number of vessels in the proximity of each other at one go is not yet clear so one would recommend that the number of vessels working within the protected areas from late evening to early morning should be the least possible. This should reduce disturbances when passing through the protected areas. The impacts of such works on the protected species are unknown albeit one would expect that it would be minimal especially in view of the distances between the breeding sites and the pipe laying areas. However, one must also understand that these areas are known rafting and feeding areas. Disturbances during this critical stage of the life cycle could result in loss of offspring and drop in population, albeit, temporary. Transhipments and supply transfers should take place during day light hours.

5.11 Lighting impacts

Lighting at the Terminal area should be limited to down lighters and avoiding floodlights where possible. Unless necessary for security reasons lights should be wall mounted or if placed on poles these shouldn't extend beyond the height of buildings. Lights facing seaward should be avoided as much as possible. One should also avoid light bouncing off surfaces increasing the halo effect from the area.

One should consider revising the level of lighting on the pier if the FSU tanker is removed, since the only lighting required at the time would be limited to navigational lights and possibly limited security lighting which could take the form of intelligent lighting. That would further reduce the impacts resulting from light.

If the FSU is to remain there, one should consider revising the necessary lights on deck and their orientation. This also applies for the pier. One should also consider intelligent lighting solutions.

6.0 Residual impacts, compensatory measures and monitoring programme

Residual impacts are those impacts which are bound to remain after taking into consideration the proposed mitigation measures.

Despite the comprehensive adoption of the recommended mitigation measures, a number of unavoidable residual impacts are still expected to arise, namely:

- Obliteration of sensitive benthic assemblages (coralligenous ones settled on rocky outcrops or on unvegetated sand mainly, given that seagrass meadows will be largely spared such impacts) falling directly within the footprint of seabed interventions (i.e. pipeline, pipeline support structures, cable crossings, transition pit prior to the MT section),
- Smothering of sensitive benthic assemblages through re-suspension/re-mobilisation of fine particulates through seabed disturbance activities (e.g. dredging in connection with the transition pit),
- Anthropogenic generation of submarine noise,
- Discharge and subsequent dispersion of waste drilling muds into the marine environment and the
- Fouling of the laid pipeline by epibiotic species.

A limited amount of siltation is bound to remain within the immediate proximity of the working vessels at sea. The climatic conditions during the recommended working period are not bound to help in achieving the desired results and it is understood that the currents along that part of the coast are rather strong so the dispersion of sediments could be difficult to contain within the desired limits. If works take place during the March to September period, the chances are that silt dispersion could be better managed.

The machinery utilised for such a project is heavy machinery and high-powered engines are in use so the amount of noise abatement could also be limited and a certain level of noise is bound to remain. The remaining impacts and disturbance generated from such impacts will much depend on the level of noise remaining following mitigation measures. ERA could set a threshold on the noise levels which should not be exceeded during the construction phase.

Works during the pre-laying period could result in bird species abandoning their nesting grounds, thus affecting the population of the species (temporary impact). It could also affect their energy levels since they might need to travel longer distances.

Works during the incubation period could have even impacts of a higher significance. In the case of both Shearwater species, incubation takes place alternatively by both sexes and change place every few days so delays could have an effect on the wellbeing of the individual parent and the fate of their offspring. In the case of the Storm Petrel incubation which takes 38 days and is carried out by both parents and takes longer if the egg is not incubated regularly.

Works during the rearing period would have an even higher impact significance since during this period parents need enough resources for themselves and also their offspring. The success of rearing their offspring depends much on the regular availability of food. If the parents fail to reach their nests due to disturbance activities their offspring are at stake and this can have an effect on their population.

When the offspring are bound to leave their nests, this usually takes place in the absence of their parents and in most cases, they leave their nests out of instinct and because they have gained enough strength to fly. During this period, it is lights which are their worst enemy since they tend to move towards sources of light and get grounded or disoriented. The residual impacts during this period could be significant if the birds get injured and cannot fly, otherwise, if caught and be allowed a second chance to fly they will leave safely without much harm.

The residual impacts resulting from the removal of the FSU are still negative since there would still be other sources of light in the proximity. Better management of these light systems should reduce the significance level. Any sources of light in the proximity of the breeding colonies always results in adverse impacts on the breeding species. This is not only limited to lights from the DPS but also lights from the Freeport area and surroundings.

Leaving the FSU in place with all the existing lights and adding more lights at the new Gas Terminal facility would result in a slighter increase in impacts. Revising the lighting on the FSU and pier could reduce the level of impacts resulting from sources of illumination.

6.1 Monitoring Programme

Should the Scheme be permitted to be developed, a monitoring programme should be set up and implemented during both the construction and operational phases of development.

The construction management plan prepared at project planning phase will be updated by the chosen EPC contractor in order to ascertain that the best practicable environmental options available are followed through.

During the construction phase, periodic monitoring is being recommended to ensure that mitigation measures are in place and working as they should. This would ensure that no unwarranted impacts arise due to deviations from proposed working practices. Such deviations could have additional impacts over and above those originally predicted. It is being recommended that when work is being carried out in the protected areas, such monitoring should be undertaken on a daily basis. Once outside these areas, this could take place on a weekly basis. There should be regular contact between the operations officer in charge of all the works and the monitor responsible for works and ERA in order to address any problems which could arise in due course.

A BACI (Before-After) marine ecological monitoring approach is proposed, consisting of the following design:

(i) Adoption of the mapping datasets collected during the pre-permitting phase to characterise the 'Before' component (Reference to EIA baseline studies will be made)

(ii) Collection of a second tranche of monitoring data, collected in replicate fashion to the 'Before' dataset (concomitant and collocated survey sites, as well as matching seasons and data collection techniques), so as to represent the 'After' component

(iii) A semi-quantitative comparative approach is conducted, in order to identify any significant changes between the two tranches. One possible way of doing this is through the application of machine learning protocols (in the form of image analysis) to the processing of ROV footage, as has been applied previously within Maltese waters as a part of a separate environmental monitoring project (the Malta-Sicily Interconnector – Gauci et al.).

A minimum interval of 12 months should be allowed prior to the conduction of the second survey, in order to enable ecological responses to the disturbance wrought to the impacted marine ecosystems to emerge. The adoption of control sites within the monitoring protocol is a possibility, although the sheer extent of the surveyed marine area makes this option a challenging one.

In view that offshore works are planned during the breeding season, it is highly recommended that the populations of the three species are monitored regularly prior to commencement of works, during works and also on the following year/s to ensure that the populations have not been affected by the works. This could take various forms, such as radio tracking or satellite tracking devices installed on birds to understand their behaviour during works, population counts at the breeding sites, boat-based observations or other means to better understand whether there were any significant impacts.

All monitoring data should be presented to the relevant authorities at pre-agreed frequencies.

7.0 Alternative solutions

Table 14 assesses the marine ecology impact of different hypothetical alternatives which could be adopted during the implementation of the project. Only technically-feasible alternatives are included within such an assessment. For instance, no alternatives to the discharge (restricted or unrestricted) of drilling fluids/muds have been considered within this assessment given that this is an unavoidable aspect of the project implementation which can only be partly mitigated.

Table 14: Alternative scenario assessment for proposed pipeline

Possible Alternative Solutions	**Evidence of how the alternative solutions were assessed**	**Describe the relative effects on the conservation of the site/habitat type/species**
A - Alternative pipeline laying methods in nearshore/coastal waters		
Alternative 1– trenchless method involving MT at approaches having water depths higher than 42m	Assessment of the baseline benthic survey of the conservation status of the various benthic assemblages, and of their sensitivity (inferred through existing literature on similar case studies) to the foreseen activities, in the area	Limited (given the sparse occurrence, if at all, of this seagrass species at this depth) regression of *Posidonia oceanica* meadows and other sensitive receptors to changes in sediment budget (e.g. through remobilisation of fine particulates), to localised changes in the hydrodynamic regime (e.g. induced changes in seabed typology) and to smothering through deposited sediment (e.g. *Cymodocea nodosa*, *Cystoseira brachycarpa*). Applicant is confident that design of proposed excavation pit has been optimised so as to minimise its footprint and environmental impact. This alternative is not technically feasible given that the increased depth of the exit would make it technically impossible to recover the TBM and the tunnel length would be at technology's limit.
Alternative 2 (Current Scenario)– trenchless method involving MT at approaches having water depths lower than 42m		Heightened impacts due to denser seagrass meadows and photophilic assemblages of conservation importance
Alternative 3 – gas pipeline laid on seabed over entire seabed stretch extending till shoreline		Avoidance of the foreseen impacts arising from the trenching technique. Nevertheless, the exposed pipeline would need to be protected with gravel for depths lower than 30m to minimise physical damage.

Possible Alternative Solutions	Evidence of how the alternative solutions were assessed	Describe the relative effects on the conservation of the site/habitat type/species
		This would result in greater disturbance to the seabed and surrounding habitats.
B - Alternative pipeline laying methods in offshore waters		
Alternative 1 (Current Scenario) – pipeline is allowed to rest on the seabed, with no trenching or any other active burial mechanism being envisaged besides that strictly associated with the excavation of the transition pit	Assessment of the baseline benthic survey of the conservation status of the various benthic assemblages, and of their sensitivity (inferred through existing literature on similar case studies) to the foreseen activities, in the area.	Obviation of erect rigid species, or colonies of, lying along the proposed pipeline route. Given that the selected route largely avoids outcrops and pinnacles, expected to be of high conservation importance, this impact is expected to occur on a minor scale.
Alternative 2 – pipeline is buried in an ad hoc trench		Heightened impacts all along the proposed pipeline route through the mobilisation of fine benthic sediments (and associated changes in sediment budgets) and the generation of a turbidity plume as well as through the direct obviation of benthic assemblages lying directly within the footprint of such trenching activities and in the immediate vicinity through overspill of impacts.
Alternative 3 – limited trenching measures are foreseen (as for Scenario 1), but surface mechanical (anti-anchoring) protection features are included in the design, entailing the installation of layering along the surface of the pipeline or through backfilling		Similar marine ecology impacts to Alternative 1 are anticipated, with the difference that settlement of epifouling species, some of which are of high conservation importance (e.g. Bond et al., 2018) will be mitigated due to the non-sedimentary nature of such protection measures; backfilling may result in the overspilling of the inert material used for the backfilling operations onto benthic assemblages of

Possible Alternative Solutions	Evidence of how the alternative solutions were assessed	Describe the relative effects on the conservation of the site/habitat type/species
		high conservation importance flanking the actual pipeline route.
C - Alternative measures to avoid pipeline free spans		
Alternative 1 – selection of the pre-trenching, dredging technique to avoid pipeline freespans, especially in nearshore areas	Assessment of the baseline benthic survey of the conservation status of the various benthic assemblages, and of their sensitivity (inferred through existing literature on similar case studies) to the foreseen activities, in the area.	Heightened impacts all along the 150m-long pre-trenching stretch through the mobilisation of fine benthic sediments (and associated changes in sediment budgets) and the generation of a turbidity plume as well as through the direct obviation of benthic assemblages lying directly within the footprint of such trenching activities and in the immediate vicinity through overspill of impacts. The need to bridge such free spans is highest along the KP 142-158 stretch, characterised by a highly complex and heterogenous seabed as well as an array of sensitive benthic assemblages (Figure 30).
Alternative 2 (Current Scenario) – selection of the gravel-based pipeline support system		Marine ecology impacts are expected to be of a considerably lower magnitude given that the need for such 'infill' pipeline support systems will be felt only along highly infrequent stretches of the pipeline route and hence the total impacted footprint will be much lower. In addition, much lower volumes of benthic sediment are expected to be mobilised through this technique.
Alternative 3 – no pipeline support systems are implemented over free span areas		No direct benthic impact on benthic assemblages of high conservation importance, except for those areas where the pipeline comes in direct contact with these

Possible Alternative Solutions	Evidence of how the alternative solutions were assessed	Describe the relative effects on the conservation of the site/habitat type/species
		same assemblages (this is expected to happen mainly in areas characterised by fine sediment), with the pipeline spanning freely between adjacent rocky outcrops.
D - Alternative pipeline pre-lay, cable-crossing strategies		
Alternative 1 (Current Scenario) – engineering of rock berms, mattresses and/or grout bags as pre-lay works	Assessment of the baseline benthic survey of the conservation status of the various benthic assemblages, and of their sensitivity (inferred through existing literature on similar case studies) to the foreseen activities, in the area, and foresight of the hydrodynamic regime of the area through an ad hoc mathematical modeling study.	The benthic assemblages falling directly within the footprint of the pre-laying installations would be irreversibly obliterated, whilst the deployment of such measures might potentially result in the disturbance of contiguous benthic areas through the re-suspension/re-mobilisation of fine sediment.
Alternative 2 – no pre-lay works are implemented, and pipeline is simply laid over existing cables		No evident impact on benthic living assemblages will arise.
E - Alternative gas land terminal development strategies		
Alternative 1 (Current scenario) – land reclamation within Marsaxlokk Bay in order to accommodate the foreseen gas terminal on land	Assessment of the baseline benthic survey of the conservation status of the various benthic assemblages, and of their sensitivity (inferred through existing literature on similar case studies) to the foreseen activities, in the area, and foresight of the hydrodynamic regime of the area through an ad hoc mathematical modeling study.	Benthic assemblages falling directly within the seabed footprint to be reclaimed will be irreversibly obliterated, whilst fine particulates will be re-suspended in the water column, with such a turbidity plume potentially extending over a much larger footprint.
Alternative 2 – no land reclamation is conducted, with the gas terminal being constructed within the existing confines of the Delimara powerstation		No evident impact on benthic living assemblages will arise.
F - Alternative hydrotesting strategies		

Possible Alternative Solutions	Evidence of how the alternative solutions were assessed	Describe the relative effects on the conservation of the site/habitat type/species
Alternative 1 (Current Scenario) – flushing of initial pipeline wash fluid during initial hydrotesting	Assessment of the baseline benthic survey of the conservation status of the various benthic assemblages, and of their sensitivity (inferred through existing literature on similar case studies) to the foreseen activities, in the area, and foresight of the hydrodynamic regime of the area through an ad hoc mathematical modeling study.	The discharge of large volumes of fluid/liquid directly over a benthic area is expected to lead to local scouring effects and to considerable changes in sediment budgets, especially if the seabed is characterised by fine sediments, as well as to physical damage to benthic erect species. There is a very high probability that the hydrotesting stage will not constitute a water quality hazard as this stage will be conducted with inhibitor-free seawater followed by freshwater, such that both types of water can be safely disposed of at sea.
Alternative 2 – no flushing of such fluid is conducted		The putative marine ecology impacts do not arise.
G -Alternative drilling fluids recovery strategies		
Alternative 1 (Current Scenario) – recovery of most of the lubricant drilling fluids is adopted, although the discharge of small quantities of the same fluids into the marine environment is still envisaged		Drilling fluids, albeit being largely composed of water, still contain a solid matrix in the form of a muddy slurry, which is expected to settled on the seabed by gravity. As a result, the deposition of this muddy slurry is expected to impact sensitive sessile assemblages and possibly lead to siltation and smothering.
Alternative 2 – no recovery of drilling fluids is embarked upon		The same category of marine ecology impacts is expected to arise, albeit on a considerably larger scale.
H - Alternative servicing barge anchoring protocols		

Possible Alternative Solutions	Evidence of how the alternative solutions were assessed	Describe the relative effects on the conservation of the site/habitat type/species
Alternative 1 (Current Scenario) – servicing barges (e.g. split barges, support barges, crew barges, etc) anchor indiscriminately (i.e. without any consideration to the distribution of benthic assemblages) within the Area of Study		Anchors exert a direct physical impact on seabed integrity, by damaging and destroying erect, rigid, benthic species falling directly under their footprint, besides impacting a considerably larger benthic swath if dragged along the same seabed.
Alternative 2 – servicing barges anchor exclusively within areas characterised by seabed areas ascribed a low conservation value (e.g. unvegetated, mobile sediment seabed).		Although benthic species of high conservation importance do occur within unvegetated mobile sediment seabeds, these occur at lower abundances and thus marine ecology impacts are expected to be considerably less significant.

7.1 Alternatives considered by the applicant

Some of the alternatives listed in Table 14 were considered by the applicant during the design phase of the project. Table 15 summarises which alternatives were studied in further detail by the Front End Engineering Design team and the outcomes from such considerations:

Table 15: Outcomes from alternatives by FEED team

Alternative	Outcome
Alternative A1	Deemed technically difficult due to limitations of Micro-tunnelling technology at depths greater than 42m
Alternative A3	Deemed risky as the pipeline would have a large free span length increasing its exposure to physical and mechanical damage
Alternative B3	Already considered as part of the proposed development
Alternative C1	Already considered as part of the proposed development
Alternative C3	Free span areas would increase the likelihood of pipeline damage.
Alternative D2	Technically impossible to implement.
Alternative E2	Technically impossible to implement due to space limitations on site.

Alternative F1	There is a very high probability that the hydrotesting stage will not constitute a water quality hazard as this stage will be conducted with inhibitor-free seawater followed by freshwater, such that both types of water can be safely disposed of at sea.
Alternative F2	Technically impossible to implement.

8.0 References

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Appendix I: Terms of Reference

Terms of Reference for the Preparation of an

Appropriate Assessment

PA 8757/17

PROPOSAL FOR THE CONSTRUCTION OF THE MALTA-ITALY GAS PIPELINE EU PROJECT OF COMMON INTEREST, INCLUDING A TERMINAL STATION AT DPS, AN ONSHORE HDD ROUTE THROUGH DELIMARA PENINSULA AND THE LAYING OF AN OFFSHORE 22" DIAMETER PIPELINE EXTENDING UP TO GELA, SICILY, SITE DELIMARA POWER STATION AND OFFSHORE ROUTE WITHIN THE MALTA TERRITORIAL WATERS, DELIMARA, MARSAXLOKK, MALTA.

Note 1 This document is intended to set out minimum specifications that need to be satisfied in order to determine whether the proposed intervention or any part thereof will have a significant impact on the integrity of any relevant protected sites, ecosystems, habitats and species covered by the provisions of the Flora, Fauna and Natural Habitats Regulations (S.L. 549.44).

Note 2 The applicant is to propose consultants for ERA approval prior to the commencement of the Appropriate Assessment (AA) studies.

Note 3 It is the consultants' responsibility to adopt and justify the appropriate methodologies and areas of influence. Furthermore, in the interest of optimising the assessment process, the proposed methodology is to be discussed with ERA prior to actual commencement of the studies.

Note 4 Unless otherwise specified in these Terms of Reference (TORs) and in the absence of any site-specific conservation objectives drawn up by ERA, the assessment shall be guided by the following environmental objectives:

- Where the conservation status is favourable, this is retained and not reduced; and
- Where the conservation status is not favourable, this is improved.

Note 5 The requirement for further AA studies needs to address the issues outlined in the screening carried out by ERA, as well as any other AA-relevant impacts identified by the consultants. Should further surveys be deemed necessary by the consultants, ERA is to be informed of such need PRIOR to the commencement of such surveys.

Note 6 Wherever available, already-existing information should be made use of without any unnecessary duplication of work. Any uncertainties and gaps in information should be acknowledged.

Note 7 The consultants should refer to the appropriate EU guidance documents, and should clearly quote such sources accordingly.

Note 8 ERA reserves the right to question (or disagree with) the methodologies and area of influence, to request revisions thereof, and to request additional information or studies at any stage prior to, during and following completion of the AA.

Note 9 These TORs are primarily intended to guide the AA investigations rather than as a basis for tendering or other non-ERA processes. In this regard any use for such purposes is at the sole risk of the applicant, as requirements may vary following technical negotiations, updating of legislation or standards, changes to the proposed project, or other circumstances.

The proposal requires the submission of an Appropriate Assessment (AA) as per Regulation 19(1) of the Flora, Fauna and Natural Habitats Protection Regulations, 2006 (S.L. 549.44), given that the project may cause significant impacts on protected sites: MT0000107 – Il-Bahar tal-Grigal – Special Protection Area and MT 0000108 – Il-Bahar tal-Lvant – Special Protection Area as declared through the provisions of the Flora, Fauna and Natural Habitats Regulations of 2006 (S.L. 549.44).

The Appropriate Assessment report should follow the following format:

1. Executive Non-Technical Summary

A description of the salient points of the AA study including surveys, impacts and their significance, proposed mitigations measures, and any residual impacts.

2. **Project Description**

A description of the proposed project, with particular emphasis on those elements that are likely to give rise to potentially significant effects on the on the integrity of the protected site, or on its habitats species and ecosystems. The description shall also address any foreseeable consequential requirements or implications of the proposal (e.g. need for new or altered access or infrastructure).

3. **Site Description**

A general description of the site environment within the area of influence, with particular emphasis on the salient features of the site and its species, habitats and ecosystems. Any other aspects of the physical environment and its processes that may in any way interact with the development or its impacts shall also be described.

The description shall also address any other constraints relevant to the site, including statutory legal protection, any relevant management plan framework.

4. **Impact Assessment vis-à-vis the integrity of the site and its species, habitats and ecosystems.**

An evaluation of the way in which the integrity of the site and its species, habitats and ecosystems are likely to be affected by the project.

Impact assessment should clearly indicate all foreseeable direct and indirect impacts, and their expected timeframes (short/long-term, etc.). Any impact interactions (e.g. accumulation, synergy, interaction with natural forces) shall also be identified and assessed. The significance of all AA-relevant impacts must also be discussed.

Impact assessment shall also take into account practical implications (e.g. conflicts with site protection or management plan implementation, any foreseeable constraints on future management plan formulation, etc.)

5. **Mitigation Measures**

Where possible, measures should be identified to eliminate and/or mitigate adverse effects on the integrity of the site as well as on the relevant habitats and species.

In this regard, the AA should include:

- A reasonably detailed identification of the measures to be introduced for all relevant phases of the project;
- An explanation of how the measures will eliminate and/or mitigate adverse effects;
- Evidence of how the mitigation measures will be tangibly implemented and by whom;
- Evidence of the degree of confidence in their likely success;
- A timescale, relative to the project, when they will be implemented;
- An explanation of any proposed monitoring scheme and how any mitigation failure will be addressed; and
- Proposals for decommissioning as may be appropriate.

6. Residual Impacts

The report should include a prediction of residual impacts and implications of the proposal on the site and its species habitats and ecosystems, following the implementation of the mitigation measures. The report shall also evaluate the significance of such residual impacts and implications. Residual impacts are to be evaluated individually as well as holistically.

7. Alternative solutions

A list of alternatives to the proposal is to be submitted. Examples of alternatives may include, but not necessarily limited to, alternative technologies, alternative layouts, and relocation or downsizing of the project. The zero-option (do-nothing scenario) should also be considered. Each alternative is to be thoroughly assessed by comparing it with the original proposal and clearly indicating the relative effects on the site's listed habitats and species.