

Geophysical, Geological, Environmental and Geotechnical Program Guidelines

***GEOPHYSICAL, GEOLOGICAL, ENVIRONMENTAL and GEOTECHNICAL
PROGRAM GUIDELINES***

**Petroleum Resources Development Secretariat
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Geophysical, Geological, Environmental and Geotechnical Program Guidelines

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1. INTRODUCTION

The Ministry of Petroleum and Petroleum Resources Development is responsible for the administration of exploration and exploitation of petroleum resources offshore and onshore Sri Lanka. These Guidelines have been prepared to help Contractors/Operators who wish to conduct a geophysical, geological, environmental or geotechnical program within this area. The Guidelines are based on the Petroleum Resources Act No. 26 of 2003.

In these guidelines, geophysical operations are described as those involving the indirect measurement of physical properties of rocks. This includes 2-D and 3-D seismic surveys, seabed surveys and airborne gravity and magnetic surveys. In the case of well- related seismic surveys any surveys where the seismic source is activated from a vessel rather than suspended directly from the drilling unit is also considered a geophysical program, e.g. walkaway vertical seismic surveys. Geological programs are described as those involving the collection and analysis of lithological, paleontological or geochemical materials; geotechnical programs are described as those involving the measurement of physical properties of seabed and subsoil and environmental programs are described as those involving the study of physical , chemical and biological elements of the lands, oceans or coastal zones.

Prospective Contractors/Operators who propose to conduct programs should be aware that additional government legislation may apply and the relevant government authorities such as Merchant Shipping and Immigration and Emmigration should be consulted. The Contractor/Operator is required to register with of Immigration & Emmigration, and obtain necessary visas for foreign personnel.

For most programs information must be submitted to the Petroleum Resources Development Committee (PRDC) at three stages; at the time of application for authorization, during field operations and after completion of the program. The information required and the timing of its submission is included for each case.

Within these guidelines, geophysical, geological, environmental or geotechnical programs will be referred to as technical programs and the personnel responsible for collecting the data relating to these programs as the technical crew.

Additional information and copies of relevant forms may be obtained from the;

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No. 80, Sir Ernest De Silva Mawatha, Colombo - 7.*

Telephone : 94-11-2375327, 2564352

Fax: 94-11-2375672

e-mail : sl.prds@yahoo.com

2. AUTHORIZAITONS

2.1. Programs with Field Work

Any technical program involving field work in the offshore area must be authorized by the PRDC prior to its commencement. The Environmental Assessment for a proposed technical program must be submitted at least 60 days in advance of the proposed commencement date. The balance of the material is required at least 30 days prior to program commencement. Application for authorization should be made on the relevant application form. A sample copy of an application form is given in **Appendix 1**.

Upon receipt of an application for authorization, the PRDC will notify and / or will consult those Government departments that may have interests in or concerns about the proposed work. Comments received from these departments are taken into account by the PRDC in establishing conditions for the program authorization granted to the Contractor/Operator. During the review of an application for authorization the PRDC will address the following concerns:

- Program description;
- Safety of operations;
- Sri Lanka benefits;
- Environmental protection;

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The information pertaining to these matters that must be submitted with the Application for Authorization is outlined in the Section. below.

Once all concerns have been satisfactorily addressed by the Contractor/Operator, the work or activity may be authorized by the PRDC. The authorization will be effective for six months from the authorization date with the exception of authorizations to conduct Walkaway Vertical Seismic Surveys for development projects, which will expire at the same time as the Drilling Program Authorization issued for the project. Programs in geographically distinct areas require separate authorizations and a unique program number will be assigned by the PRDC for each program. This should be quoted on all subsequent correspondence. Any subsequent amendment or addition to the program must be forwarded to the PRDC for approval. Significant additions or amendments may require an additional authorization.

An Authorization may only be extended if the field work is in progress at the time of the expiry date of the authorization.

2.1.1. Program Description

A full description of the proposed field work should be submitted including the following information.

1. Two completed, signed application forms including a detailed description of the aims and objectives of the proposed program and any relevant supporting documentation. For example, for geophysical programs, relevant documentation would include descriptions of source and detector equipment, including geometry and configuration, peak pressure and rise time of source and acquisition parameters.
2. One copy of a location map detailing the proposed program and its relationship to the land interests in the area.
3. One copy of a page size map showing the relationship between the proposed program and neighboring coastlines and other pertinent geographic features.

4. For a geophysical program, a digital file with beginning and end points for each proposed 2D line or an outline of the area to be surveyed for a 3D program. Data should reference WGS 84.
5. Resume of principal sub-contractor.

2.1.2. Safety of Operations

For all programs involving fieldwork Contractors/Operators are required to submit a duly executed "Declaration of Fitness". This document attests that the Contractor/Operator has ensured that in addition to meeting all the specific requirements of applicable legislation,

- the equipment and installations are fit for the purposes for which they are to be used;
- the operating procedures are appropriate;
- the personnel are qualified and competent and
- this situation will continue for the life of the program.

Prior to authorizing the program the PRDC requires that the Contractor/Operator demonstrate due diligence with respect to this "Declaration of Fitness". As program activities are usually conducted by sub-contractors, this demonstration normally requires the submission of the following documentation.

- 1). The Contractor's/Operator's policies and procedures as they relate to the management of sub-contractor safety for the type of activity defined in the application.
- 2). Safety criteria and reviews in the bidding process including any requirements for audit or inspection.
- 3). Safety related clauses in contracts.
- 4). Arrangements for monitoring compliance during program execution.

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- 5). The name, address, work history and safety record of the principal sub-contractor(s)

If the Contractor's / Operator's own equipment and personnel are to be used in the program then the demonstration requires the submission of and /or reference to applicable company documentation.

The following lists are provided to give Contractors/Operators guidance on the type of information to be submitted and / or made available as appropriate. The lists are not intended to limit the Contractor's/Operator's overview of a project and Contractors/ Operators have the responsibility to assess and ensure appropriate management of all hazards. While information may be reviewed during the field audit, prior submission of required information is strongly recommended as this reduces the time required for field audits. If items that do not comply with the legislation or stated policies are discovered during the field audit these will have to be corrected prior to issuing the authorization.

Note : One electronic copy and one print of the documentation is required.

(a) Marine Programs

For programs that propose to use a marine vessel, or vessels the following information/ documentation is required.

- 1). The principal sub-contractor's and / or vessel operator's/owner's Safety Policy and Procedures Manuals.
- 2). A description of each vessel including:
 - a). name, class, registry, number and signal letters;
 - b). gross and net tonnage;
 - c). dimensions (length and breadth), draft, displacement, freeboard;
 - d). fuel and water capacities;
 - e). type of fuel oil used;
 - f). range;
 - g). safety equipment;
 - h). method of propulsion;
 - i). communication/navigation equipment; and
 - j) accommodation.
- 3). Operating history of each vessel.
- 4). Safety record of each vessel

5). Copies of all statutory and class certificates to prove seaworthiness of the vessel or vessels and copies of the certificate of competency of the masters and crew members.

6). A copy of approved Ship Board Oil Pollution Emergency Plan.

7). Ship generated waste disposal mechanism and procedure.

8). Disposal procedure of hazardous material and the material safety data sheets.

9) Procedure of vessel refueling.

10). Berthing arrangements if and when necessary.

11). Warning system for other users in operation (for the safety of maritime traffic including fisheries vessels).

12). Details of arrangements for the vessel to maintain regular communications with a shore base during operations including procedures to be followed in the event of an overdue contact with the vessel.

13). For vessels arriving from outside Sri Lanka ports, arrangements for the testing of potable water prior to the commencement of the program to ensure that it meets international standards.

14). Sufficient information to show that all pressure systems used by the technical crew have been designed, constructed, certified, installed and inspected in accordance with acceptable standards.

15). Documentation confirming that those members of the technical crew required to operate and maintain components of the seismic energy source, if used, are adequately trained.

16). Documentation verifying that any lifting gear (wire ropes, slings, chains, fittings) to be used in the program have been certified.

17). Where temporary equipment or structures have been installed, documentation to show that the sea fastening has been properly designed and installed.

18). Confined space entry, hot work and isolation/lock out of equipment procedure for :

i. marine crew; and

ii. technical crew.

Note-

Such procedures must include provisions to ensure they are coordinated between both crews.

19). Information to show that crews have received training and instructions regarding any hazardous substances or conditions to which they may be exposed.

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20). Details of the program to ensure that hazardous substances are properly labeled and that Material Safety Data Sheets are available and warning signs are posted onboard the vessel.

21). Confirmation that an adequate First Aid Kit will be maintained on board during the program.

22). Information to show that an adequate number of First Aid attendants and Medics will be present on board during the program.

23). If the vessel complement will be more than 40 persons, information to show that the vessel has an adequate first aid room.

24). Details of arrangements to make a medical practitioner available for consultation with the vessel at all times.

25). Documentation verifying that all members of the technical crew have completed an approved survival course (Marine Emergency Duties A1 (MED A1), Basic Survival Training (BST) or equivalent). If helicopter transport is to be used, completion of BST or Helicopter Underwater Escape Training UHUET) module is required.

26). Confirmation that an adequate number of approved abandonment suits, appropriately sized to fit all personnel, both marine and technical, will be maintained onboard during the program.

27). Information to show that procedures and equipment are in place to :

- a). Prevent person overboard situations; and
- b). deal with person overboard situations should they occur.

28). If helicopters are to be used for crew changes during the program, the following information;

(a) Verification that the vessel's helicopter deck meets the requirements approved by the Director General (e.g. Det Norske Veritas, Offshore Standard DNV – OS – E 401) and is suitable for the type of helicopter to be used;

(b) certificate of Airworthiness for the helicopter;

(c) details of pre-flight briefings;

(d) confirmation of availability of approved helicopter suits;

(e). description of flight following procedures; and

(f). procedures to be followed in the case of a missing or overdue helicopter;

29). If a marine vessel is to be used for crew changes during the program the following information;

(a). details of the transfer procedure including weather limits; and

(b). confirmation that the operator has reviewed and accepted the transfer procedure.

(**Note** : Transfers at sea should be avoided if at all possible. If deemed necessary, however, they should only be carried out in ideal weather conditions. Transfers at sea require the use of appropriate protective equipment that provides flotation and sufficient manual dexterity. A suitable person overboard boat must be available in addition to the boat being used for transfer.)

30). Information to show that an occupational health and safety committee or representative has been established.

for the technical crew.

Note - Where separate committees/representatives exist, provisions for co-operation between the two crews must be included.

31). Information showing that the technical crew's right to refuse dangerous work is known to vessel and technical management.

32). Confirmation that procedures are in place to handle dangerous work refusals.

33). Details of how the Contractor/Operator has ensured that language differences will not affect the safety of operations.

Operators /Contractors are expected to ensure that their personnel and their sub-contractor's personnel are familiar with the applicable legislation.

The Contractor/Operator must arrange for a Field Verifications Audit onboard the vessel prior to commencement of the program unless this requirement is waived by the PRDC. This audit may take up to 12 hours to complete.

(b) Airborne Programs

If the proposed field work is to be conducted using an aircraft, the following information/documentation will be required.

1). The name, address, work history and safety record of the aircraft operator/owner.

2).The air operators certificate (AOC) and operations specifications and the State/States by which the current AOC or AOCs are issued in case multiple operators are involved and a copy of a valid certificate of Airworthiness of the aircraft.

3). A general description of the aircraft to include the following;

(a) Type of aircraft to be used for the operations;

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- (b) State/States of registry of aircraft;
- (a) registration, designation, call sign;
- (c) dimensions;
- (d) fuel capacity and type of fuel;
- (e) range;
- (f) safety equipment;
- (g) communications and navigation equipment;
- (h) operating history; and
- (i) safety record

4).Local collaborations for aviation related aspects and agreements (example: wet lease/dry lease etc).

5).Home Base Station for the operations and maintenance purposes, and forward bases if any.

6).Operational/Maintenance management and control and the communication network of the operation.

7).Project proposal in relation to aviation activities onshore and offshore.

8).Type of helideck operations (fixed, mobile & vessels) and deck specifications, limitations.

9). A description of ;

(a). the flight following procedures
and

(b) the procedures to be followed in overdue aircraft.

If the aircraft is not registered in Sri Lanka additional information may be requested.

(c) Programs using a Mobile Offshore Drilling Unit

If the proposed program is to be conducted using a MODU, additional information/documentation may be required.

2.1.3. Sri Lanka Benefits

“Local Goods and Services” provisions shown in **Appendix 2** are applicable to all technical programs.

The following summarizes the PRDC’s requirements.

- 1). A Benefits Plan must be submitted by the operator for approval by the PRDC. The Benefits Plan should include, at a minimum the following information.
 - a). As per section 16 of the Petroleum Resources Act any person carrying on business as a petroleum sub-contractor has to obtain a license issued in that behalf by the

PRDC and any such person carrying out any work or activity in the offshore area must have an appropriate presence in the Province. In the case of a seismic survey this will apply to the company applying for the authorization to conduct the program.

b). A description of the proposed program, including location, duration, vessels, etc.

c). A description of the operators policies and initiatives to provide full and fair opportunity to Sri Lankan companies and citizens in procurement and employment activities, with first consideration to Sri Lankan companies and citizens.

d) A description of the successful sub-contractor, and, if applicable information supporting the choice of a foreign sub-contractor and / or vessel.

e). A listing of all marine and technical crew members who will be employed during the program. The listing should include the nationality of each crew member and their residency at the time of hire, along with a rationale to explain the use of any foreign workers. In addition a copy of the photo- page of a valid passport of each crewmember has to be submitted.

f). A description of the Contractor’s/Operator's plan with respect to seismic data processing.

2. An annual Benefits Report, summarizing Sri Lanka benefits related to the program is required.

2.1.4. Environmental Protection

2.1.4.1. Environmental Assessment

As part of its environmental protection responsibilities, the PRDC must ensure that an

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environmental assessment is conducted of proposed technical programs.

In addition, Contractor/Operator is required to comply with other applicable environmental legislation.

At least four months prior to the planned commencement of a 2D or 3D seismic survey the Contractor/Operator should submit a basic program description, including a schedule and the proposed location to the PRDC, Programmes that are proposed for areas where similar programs have not recently been assessed may require one to two additional months of lead time, and Contractors/Operators are advised to consult the PRDC as early as possible in these cases.

Programs such as the following may not require four months notice; seabed surveys, VSPs and technical programs like aeromagnetic or remote hydrocarbon detection. The Contractor/Operator is still advised, however, to submit a basic project description to PRDC as early in the planning process as possible.

Based on the information provided in the project description, PRDC will confirm the environmental assessment requirements and in consultation with other Government Departments and agencies, will determine the scope of the assessment.

Following receipt of a scoping document from the PRDC, the Contractor/Operator should submit a report that:

- a). Describes its assessment of the potential environmental effects associated with the proposed program. This assessment should include effects associated with reasonably foreseeable accidental events and any cumulative environmental effects that are likely to result from the program in combination with other projects or activities that have been or will be carried out. Any feasible measures that may serve to mitigate adverse effects, and the likelihood of significant adverse effects following application of these measures, should be described.
- b). Habitat details of the marine mammals in the area.
- c). Reports on any relevant consultations with interested parties who may be affected by program activities. Such parties include, but are not limited to,

the Department of Fisheries and Aquatic Resources, fishers and fish harvesting companies. The report should identify specific areas of concern that were raised in these consultations and the proposed means by which valid concerns will be addressed.

d) Is consistent with the scoping document issued by the PRDC.

e) Is in a format suitable for public release.

The environmental assessment must be submitted to the PRDC at least 60 days prior to the planned commencement of activities.

2.1.4.2. Environmental Protection Measures and Reporting Requirements

Additional mitigation measures that may be identified in the environmental assessment shall be implemented by the Contractor/Operator.

A report on the results of any monitoring undertaken during seismic programs should be submitted to the PRDC within 1 year of completion of the field work in a format that is suitable for public release.

2.2. Programs without Field Work

If a Contractor/Operator plans to claim expenditures against applicable Bank Guarantee, for a program, which does not involve field work, the program must be approved by the PRDC prior to its initiation. Examples of programs which may be eligible for such credits include the purchase and / or reprocessing of seismic data and biostratigraphic or palynological studies. Documentation describing the purpose and objectives of the program and addressing the Sri Lanka Benefits concerns should be included with a completed copy of the relevant program approval application form.

3. REPORTING REQUIREMENTS DURING FIELD WORK

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3.1. Weekly Reports

The Contractor/Operator is responsible for ensuring that reporting on the commencement and completion of the survey is forwarded to the PRDC. Weekly progress reports must be made and should include the following information:

- a). Program number;
- b). description of program activity for the week, e.g. number of kilometers of seismic recorded, names of lines recorded;
- c). details of any significant downtime and causes;
- d). any significant dates for example mobilization, suspension; and
- e). any additional information as specified in the authorization.

The required reports may be forwarded by e-mail or by other mutually agreed method.

The principal sub-contractor for the survey may submit the required reports on behalf of the Contractor/Operator, however the PRDC must be informed of the person responsible for the reporting prior to commencement of the survey.

3.2. Reporting of Accidents, Hazardous Occurrences & Significant Events

Any accident or hazardous occurrence must be reported to the PRDC immediately. Any other significant event such as a spill, overdue contact with the vessel, contact with fishing gear must also be reported immediately. Direct contact may be made at 2564352 & 0773451413. The reporting procedures for such events must also be in accordance with the Contractor's/Operator's contingency plan.

A complete investigations report must be provided within 14 days. Reports on contact with fishing gear should include the exact time and locations of initial contact and loss of contact and a description of any identifying markings, which may be observed on affected gear. A monthly summary report of accident statistics must also be provided to the PRDC. This report should include the number of disabling and/or minor injuries. The report must be forwarded to the PRDC by the 15th day of the month following the reporting period.

4. FINAL REPORTS

For geophysical, geological or environmental programs involving field work the final report must be submitted to the PRDC within one year of completion of the field work.

Geotechnical reports must be submitted within 90 days of rig release or completion of field work. For programs in which no field work is involved, the final report must be submitted to the PRDC within one year of the estimated completion date shown on the approval form.

The report should be in a form acceptable to the PRDC and contain the information described below that is relevant to the programs conducted. Interpretation reports must be submitted as print copies. In addition, a CD containing a PDF formatted copy of the report, with sufficiently high resolution for the enclosures that original quality will be maintained if reprinted, should be submitted. The numbers required of each type of report are shown in the table below.

	print	digital
Interpretation	2	2
Operations & processing	2	2

Any correction to, or omission from the report that are made or discovered after its submission must be reported to PRDC.

4.1. All Technical Programs : Common Reporting Requirements

- (a) Title page containing:
 - program number.
 - Contractor's/Operator's report name;
 - type of survey;
 - survey locality;
 - year of field work;
 - name of Contractor/Operator (or legal representative or agent) and participants;
 - names of principal sub-contractors;
 - specific interests involved;
 - name of author or person responsible for the report; and

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- report date.
- (b). Table of contents and list of enclosures.
- (c) Introduction.
- (d) Locality map, preferably page size, showing the location of the survey with respect to the licences involved and latitude/longitude co-ordinates.
- (e) Statistical summary, including
 - * Mobilization/demobilization dates;
 - * significant dates such as commencement, suspension, recommencement and termination;
 - * number of technical and marine personnel and their nationality;
 - * production data, time lost and daily production;
 - * summary of conditions pertaining to weather, or sea state and
 - * summary of factors which caused significant downtime.
- (f) Description of the data acquisition equipment and field procedures, including, where appropriate;
 - all vessels or aircrafts, including ownership and flag of registry; and
 - all components of the navigation system, with estimates of accuracy and responsibility.

4.2. Geophysical and Geological Programs: Specific Reporting requirements

Any final report submitted to fulfill the reporting requirements of a geophysical or geological program authorization should be signed by a professional geoscientist and include the following information in addition to that detailed in section 4.1. Maps and enclosures should not depend on colour to impart information such as contour values.

- (a) Additional information on the data acquisition equipment and field procedures to include:
 - the energy source parameters including pressure/time plots;
 - the detector equipment, including detector array geometry;
 - streamer tracking system;
 - the recording system;

- the on-board processing facility;
- recording parameters, such as shot point interval, station interval sampling rate, recording filter(S) settings, gain control, polarity, fold, aircraft elevation; and
- fathometer used.

(b) Description of the geophysical data processing and display, including

- * for seismic reflection data, each type of processing for which sections were generated including the processing procedures applied to the data;
- * for gravity data;
 - all corrections applied;
 - method of correcting discrepancies at line intersections;
 - method of spatial filtering, residual mapping and second derivative mapping;
 - method of gravity modeling; and loop closure maps for elevation control; and
- * for magnetic data:
 - all corrections applied to the total field data;
 - correction for diurnal;
 - correction with regional field;
 - method of spatial filtering, residual mapping and second derivative mapping;
 - method of correcting discrepancies at line intersections; and
 - method of magnetic modeling.

(c) Seismic shotpoint maps, gravity station maps, magnetic survey maps, track plots and flight lines with numbered fiducial points, which are on a working scale and show these geophysical data in relation to the Contractor's/Operator's previous data in the area. One paper print of each map should accompany each copy of the report. A digital copy of the shotpoint location data and 2 copies of the shot point map are also required. All location data should reference the WGS 84.

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(d). Copies of each migrated seismic section. Where no migrated sections were prepared, copies of the last processing of non-migrated sections should be submitted. Two copies on pre-folded paper. For 3-D surveys copies of lines and traces are required. The spacing for lines should be 1,000 metres, for traces 1,500 metres and time slices at 200 ms. For 2D data the lines

should be displayed at approximately 1:100,000 for a horizontal scale and either 2 ½ inches per second or 5 cm per second vertical scale. Two copies of the digital seismic traces both field (SEGD) and final processed (SEGY) are also required. All header information must be present for 3-D data, line and trace location information must be provided such that the data grid can be produced in landmark. All data should be submitted in a format approved by the PRDC.

Two copies of digital records of any gravity data in ASC11 format containing latitude/longitude, water depth, observed absolute value of gravity, calculated Bouguer anomaly and free-air anomaly for all data points.

Two copies of digital records of any magnetic data in ASCII format containing latitude/longitude, total field value corrected for diurnal variation and residual magnetic field for all readings.

(e) Bathymetry maps.

(f). Interpretative maps appropriate to the type of survey, which indicate the interpretation of data from the survey and integration with previous surveys recorded by the Contractor/Operator in the same area, for example:

* For seismic reflection surveys all maps displaying time structure, depth structure, isopach, isochron, velocity, seismic amplitude and character change;

* For gravity surveys all maps displaying Bouguer gravity, residual gravity field, derivative maps (if maps were not made, individual gravity profiles with sufficient annotation for interpretation); and

* for magnetic surveys all maps displaying total magnetic intensity, corrected total field, residual magnetic field and derivative maps (if maps were not

made, individual profiles with sufficient annotation for interpretation) .

(g). Any other information used or produced during the interpretation such as synthetic seismograms or seismic modeling or attribute analyses.

(h). Written discussion of the maps and sections including the correlation between the geophysical and geological events, correlations between gravity, magnetic and seismic data, details of corrections or adjustments applied to the data during interpretation, examples of correlated seismic sections which illustrate the interpretative technique for structural and stratigraphic interpretation, and any velocity information used for time to depth conversion.

(i) Geological program reports should include a written discussion of the results of the project and tie the project into the regional geological framework.

Illustrations should include:

- measured sections;
- relation or structural cross sections;
- core or sample descriptions;
- geochemical and other analyses;
- micro-paleontology and palynology and
- Interpretative maps such as paleogeographic, facies and isopach.

4.3. Non-Exclusive Geophysical or Geological Programs: Specific Reporting Requirements

Contractors/Operators of non-exclusive geophysical or geological surveys, where the data has been acquired with the intention of selling it to the public, are obliged to submit a report covering sections (a) to (f) as described in 4.1 and sections (a) to (d) in 4.2, plus any additional digital data required. If the data is withdrawn from public availability, or the PRDC becomes aware that the data is not being made fully publicly available, the Contractor/ Operator must submit sections (e) to (i) in 4.2 as appropriate, within twelve months of the date of withdrawal of the data. Purchasers of non-exclusive data, who wish to have the cost of

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the purchase offset against applicable Bank Guarantee, must submit an interpretation report covering sections (e) to (i) described in 4.2 above in addition to having completed and had approved a Geophysical/Geological Program Approval (without field work) form as detailed in Section 2.2.

4.4. Geotechnical Programs: Specific Reporting Requirements

Final reports for geotechnical programs should be signed by a professional engineer or geoscientist and should include the following information in addition to that mentioned in section 4.1.

- a). Location maps at a working scale.
- b). A description of the boring and geotechnical equipment that was used during the program.
- c). A description of sample handling procedures, storage, onboard measurements and results.
- d). A description of the laboratory procedures, measurements and results.
- e). Correlations between borehole data and available geophysical data.
- f). Interpretative maps showing distribution and thickness of relevant geological/geotechnical units.
- g) Any other information, such as bathymetry, used or produced during the interpretation of the data.

5. SEABED SURVEYS

5.1. General

Seabed surveys, using geophysical and geotechnical methods, are conducted to determine the nature of the sea floor and underlying sediments. As such they may be required to assist with the positioning of wells, pipelines or production facilities.

Prior to positioning a jack-up or gravity based structure a geotechnical survey may be required as outlined below.

- a). Jack-up Drilling Units. Prior to preloading the jack-up at a well site, an independent geotechnical engineering consultant shall evaluate the geotechnical and foundation characteristics of the seabed. In most cases, at least one geotechnical borehole (drilled no

further than 100 meters from the proposed wellsite) will be required to be drilled to a depth of the anticipated spud-can penetration plus 1 ½ times the maximum spud can diameter. In some cases, the consultant may have sufficient information to assess the foundation characteristics without the benefit of a borehole. The depth, sampling interval and number of boreholes in the program shall be at the discretion of the consultant in consultation with the Contractor/Operator.

(b) Platforms, Caissons and Artificial Islands. Where a platform, artificial island or caisson-type structure is to be used to support a drilling rig or production facility, the geotechnical and foundation characteristics of the seabed at the proposed site and/or of the fill material must be evaluated before any excavation, fill placement or installation of the structure occurs.

5.1.1. Well locations

A Contractor/Operator who proposes to drill a well must ensure that such an operation is conducted safely. The submission of an application for Authority to Drill a Well (ADW) must be preceded or accompanied by documentation to show that the Contractor/Operator has investigated the immediate area of the proposed location to identify any possible hazards to drilling on the seafloor and during the drilling of the well prior to setting surface casing. A seabed survey should be conducted to achieve these objectives. A pre-existing seabed survey may be used if the area covered by the earlier survey is adequate except in areas where movement of hydrocarbons due to drilling activity is suspect. If, however the pre-existing survey is more than two years old, an inspection of the seabed in the vicinity of the well should be carried out prior to spud. Reprocessed 3D surveys may be used to define shallow drilling hazards in deep water. It is, however, mandatory that a survey including high resolution seismic data be conducted for all wells proposed for locations in water depths less than 400m.

The wellsite survey should cover a radius of the anchor limit plus 1 km allowing for potential

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changes in location and identification of any regional features such as slump deposits. A primary line spacing of 250 m with tie lines at 500 m is recommended. Existing 3D seismic data should be used in the interpretation. For jack-up rigs, a closer line spacing, 50 m should be recorded within a radius of 200 m of the proposed location.

If the line spacing is greater than 250 m, the well can only be drilled if there are 3D seismic data available over the surrounding area. In this case the well must be located on a high resolution line. Copies of six 3D seismic lines (three in-lines and three cross-lines), no more than 250 m apart with two passing through the proposed location, should be included in the ADW applications.

5.2. Objectives

The objectives and typical methodology for seabed surveys are shown in the following Table.

Table : Objectives and typical Methodology for Seabed Surveys

Objectives	Typical methodology
Identification of shallow geological hazards-for example, slump scars, channels, faulting, gas, gas hydrates, shallow trap closure.	High resolution seismic using sparker, small airgun array, or sleeve exploder; supplemented with 3D seismic, if available.
Detailed bathymetry.	Echo sounder.
Identification of surfical geology, channel fill, slumping, faulting, gas charged sediments.	Sub-bottom profiler.
Nature & characteristics of sea floor sediments.	Side scan sonar, grab samples and/or gravity/piston cores of the sea floor and near surface sediments, sea floor photographs.
Identification of, morphology of depositional units, ship wrecks, sea floor obstructions, bedforms indicative of sea floor sediment dynamics.	Sidescan sonar, sea bottom photographs, Sub-bottom profiler.
Engineering data on seabed deformation, bearing capacity and stability (if required).	Borehole core samples in situ and laboratory tests.

Location and identification of sea floor installations, wrecks and cables.	Side scan sonar (magnetometer survey as required).
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5.3. Authorization and Reporting during Field Work

PRDC requirements for seabed surveys prior to and during field work activity are as described in Sections 2 and 3 above

5.4. Final Reports

Final reports for seabed surveys must be submitted within one year of completion of field work or prior to an Application to Drill a Well on the surveyed location. Only two copies of the final report need be supplied. Sections 4.1(a) to (f) should be addressed in the final report. The following data, specifically relating to seabed surveys, should also be included.

(a) Basic technical data

- i). Two paper copies of the relative amplitude and automatic gain control stack sections.
- ii). Digital shotpoint location data for the survey.
- iii). Prints of representative bottom photographs or a copy of the video.
- iv). Paper copies of all borehole logs and in situ test results.
- v). Prints of borehole, photographs.
- vi) Bathymetric profiles in the form of annotated single paper copies.
- vii) Sub-bottom profiler records in single paper copies
- viii) Side scan data in the form of single paper copies of corrected or uncorrected records.

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ix). Any material remaining after analysis of sea bottom samples or geotechnical test hole material.

(b) Description of the (re) processing applied to the high resolution or 3D seismic data.

(c) Results of interpretation

i). Structure maps and isopach maps of the most significant events picked from the seismic data.

ii). Detailed bathymetric map.

iii). Surficial geology map.

iv). Results of sidescan sonar surveys including side scan mosaics and a description and discussion of the distribution and morphology and sedimentary units, pock marks, sea floor photographs, sea floor feature such as sediment distribution.

v). Description of sea bottom photographs and their locations.

vi). Location and description of samples and cores.

vii). Results of any geotechnical investigations or other studies carried out during the survey.

viii). Identifications of man made obstacles.

ix). Compilation map showing type, depth and extent of features considered to be drilling hazards.

PRDC may inform other Contractor/Operators in the area if any significant hazards to drilling are detected during a wellsite investigation.

6. APPENDIX 1

GEOPHYSICAL, PROGRAM AUTHORIZATION APPLICATION

Contractor/Operator :

Objectives of Program :

Applicable Land (EL/PL/Crown Lands) :

Type of Work (check one) : Exclusive
 Non-Exclusive

Program Area :

Proposed Dates :
Commencement:..... Completion :.....

Estimated Expenditure

- 1. Field Work
- 2. Data Processing
- 3. Interpretation/Laboratory Studies.....

Proposed Vessel or Aircraft :

Number of Persons Employed : Sri Lankan..... Other

Date	Acquisition	Equipment
.....
.....

Principal sub-contractor:

Data Processing sub-contractor :

Data interpretation or Laboratory Studies sub-contractor :

The undersigned Contractor's/Operator's Representative hereby declares that, to the best of his / her knowledge, the information contained or incorporated herein is true, accurate and complete.

Signed :.....
Contractor's/ Operator's Representative

Name :.....

Address :.....

.....

.....

Date :.....

Title :.....

Telephone :.....

7. APPENDIX 2

LOCAL GOODS AND SERVICES

1. In the conduct of Petroleum Operations, the Contractor shall:
 - 1.1 give preference to the purchase and use of goods manufactured, produced or supplied in Sri Lanka provided that such goods are available on terms equal to or better than imported goods with respect to timing of delivery, quality and quantity required, price and other terms; and
 - 1.2 employ Sri Lankan Subcontractors having the required skills or expertise, to the maximum extent possible, insofar as their services are available on comparable standards with those obtained elsewhere and at competitive prices and on competitive terms; provided that where no such Subcontractors are available, preference shall be given to non-Sri Lankan Subcontractors who utilise Sri Lankan goods to the maximum extent possible, subject, however, to the proviso in 1.1.
2. The Contractor shall submit a benefits plan for acceptance and approval by the PRDC for all Petroleum Operations outlining the associated goods and services and training options earmarked for Sri Lankan nationals.