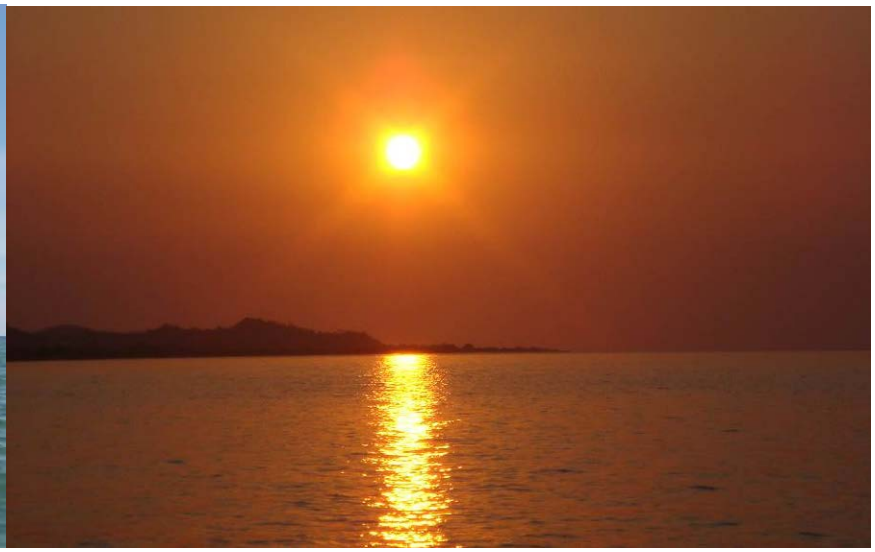
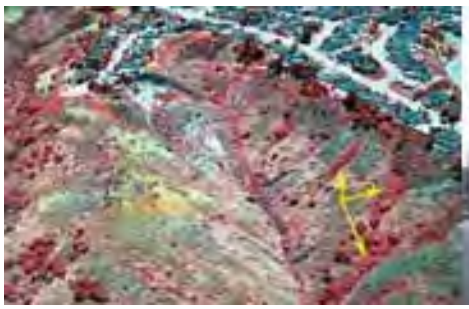
Geotechnik Ltd
geotechnical and material engineer's

Dated: 30 September 2015
Report No. GET15-8035

Geotechnical Investigation Report

URGENT SHIFT OF FERRY TERMINAL IN DILI PORT
Democratic Republic of Timor Leste

Client: JAPAN PORT CONSULTANTS, LTD, TIMOR LESTE

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Report No. GET15-8035
05 October 2015

Japan Port Consultants Ltd.
Mr. Yuzo Suzuki
Director

Attention : Mr. Yuzo Suzuki

Geotechnical Soil Investigation
Urgent Shift Of Ferry Terminal In Dili Port
Timor Leste

Gentlemen:

Geotechnik Ltd. is pleased to submit this report for our geotechnical investigation performed for the construction of the Jetty for the **Urgent Shift Of Ferry Terminal, Dili Port Project** in Republic of Timor Leste. The new facility will consist and use for loading / un-loading at the port. We performed this study in general accordance with our proposal dated 25 June 2015. The field investigation was conducted on 18 July thru 14 August 2015.

PROJECT DESCRIPTION

Geotechnik Ltd was contracted by **Japan Port Consultants Ltd.** to conduct a sub-soil investigation at the proposed location **Urgent Shift Of Ferry Terminal, Dili Port Project** in Republic of Timor Leste. The structure will be in use for loading / un-loading at the port facility purpose. The borehole locations are marked on site by representative of Japan Port Consultants Ltd.

PURPOSE AND SCOPE OF STUDY

We performed this study to explore the subsurface stratigraphy and groundwater conditions at the site and to develop engineering recommendations to guide the design and construction of foundations for the Jetty - **Urgent Shift Of Ferry Terminal, Dili Port Project** in Republic of Timor Leste. We accomplished study by:

1) drilling four boreholes to explore subsurface stratigraphy and groundwater conditions and to obtain samples of the subsurface materials for laboratory testing; and
2) analysing the field and laboratory data to develop engineering recommendations.

REPORT FORMAT

In the initial sections of this report we have presented descriptions of the field and laboratory phases of the study and the generalized subsurface conditions at the site. Recommendations for site preparation, foundation design, foundation protection, and foundation construction considerations are presented in subsequent sections. Illustrations following the report text include a vicinity map, a plan of borings, boring logs, laboratory test results and foundation design information.

FIELD INVESTIGATION

General We explored the subsurface conditions at the **U**rgent **S**hift **O**f **F**erry **T**erminal, **D**ili Port Project site by drilling four boreholes at site location. The boreholes were drilled ranging from 30 m to 45m depths below the existing sea-bed. Borehole locations was set out and staked in the field by representative of Japan Port Consultants Ltd.

Sampling Procedure Granular soil encountered in the borehole was sampled in general accordance with the standard penetration test (SPT) procedures specified in ASTM D-1586. The number of blows required with a 63 kg hammer falling 0.76 m to drive the sampler the final 0.30 m of the 0.45 m sampling interval is referred to as the SPT N value. Where very dense material was encountered, the actual penetration after the initial 0.15 m seating of the sampler is recorded for a total of 50 blows. Failure to attain the initial 0.15 m sampler penetration within 50 blows is referred to as refusal and is shown on the boring logs as "Ref" for the indicated amount of sampler penetration.

Boulder / Rock / Coral encountered in the borings was sampled by both SPT procedures. In our experience, coral is poor for vibration / cyclic and dynamic loading and good for static loading. Coral / rock coring methods are needed to explore a coral profile, since neither method is completely successful in all instances.

Sample Handling After recovery, each sample was removed from the sampler, examined, and visually classified by our geotechnical technician on site. Representative portions of each soil sample samples were then sealed, packaged, and transported to our laboratory in Republic of Timor Leste for further examination and classification.

Boring Logs A record of field observations was maintained in the form of field logs describing the visual identification of the subsurface materials encountered at different depths below the existing grade, and other pertinent field data. The boring logs were later edited to incorporate information obtained from laboratory examination and classification. The final borehole logs are presented on Plates 3a thru 6d.

Water Level Observations We measured the water level in the borehole after completion of field operations. The depth to water observations are recorded at the top of the borehole logs.

SUB-SURFACE MATERIAL– SOIL EXPLORATION

Sub Surface Material Stratigraphy The subsurface materials at the proposed **Urgent Shift Of Ferry Terminal, Dili Port Project** location mainly consist of Medium dense dark grey Sandy well graded **GRAVEL (GW)** (Gravels are sub-rounded, sub-angular Quartz) / Medium dense dark grey Silty fine to coarse **SAND** with Gravel **(SM)** (Gravels are sub-rounded, sub-angular Quartz) / Loose dark grey calcareous **SILT** with little Sand **(ML),** with low plasticity / Very loose light grey carbonate Silty, Gravelly fine to coarse **SAND (SM)** (Gravels are coral and shell fragments interbedded with Silt and Sand layers) / Loose greyish white carbonate Silty well graded **GRAVEL** with Sand **(GW)** (Gravels are coral and shell fragments interbedded with Silt and Sand layers) / Very loose dark grey carbonate **SILT** with Sand and Gravel **(ML),** with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers) / Dense whitish light grey carbonate Silty, Gravelly fine to coarse **SAND (SM)** (Coralline Sand with coral and shell fragments and flacky Quartz) / Medium dense dark grey **SILT (ML),** with moderate to high plasticity.

The representative samples collected along the depth of boreholes were analysed. The identification and classification details along with penetration resistance are presented on Plates 3 through 6d.

The details of borehole are tabulated below:

S. No.	Borehole Point	Easting, m	Northing, m	Elevation (Z), m	Depth of Borehole	Remarks
1	BH # 1	783,172.82	9,053780.58	+ 3.31	40.50	onshore
2	BH # 2	783,193.37	9,053,826.49	(-) 5.02	45.05	offshore
3	BH # 3	783,204.90	9,053,854.30	(-) 11.22	33.60	offshore
4	BH # 4	783,232.82	9,053,918.49	(-) 16.63	30.05	offshore

LABORATORY TEST RESULTS

General We performed laboratory tests on selected samples, recovered during the field investigation phase of this study, to verify field classifications and to estimate the index and engineering properties of the subsurface materials. All tests were conducted in general accordance with current applicable ASTM procedures or equivalent.

Identification Tests Identification tests performed on selected samples encountered in the borings drilled at the site included grain-size analysis (ASTM D 422) and determination of the percentage of material passing No. 200 sieve and Atterberg limits determination (ASTM D 4318). The results of grain-size analyses performed on selected samples, recovered from the borings are presented as grain size curves on Plates 11 through 19. The percentage of material passing the No.200

sieve was determined as a routine part of the grain-size analysis. Results of these tests are tabulated on the boring logs in the column labelled "-0.075, %". Liquid and plastic limits, determined for selected samples, are tabulated on the boring logs in the column identified "LL(PL)".

Consolidation Test Procedure -ASTM D-2435

Sample Measurement, Sealing and Labeling Upon removal of the tube, remove the drill cuttings in the upper end of the tube and measure the length of the soil sample recovered to the nearest 5 mm in the tube. Seal the upper and lower end of the tube by molten wax. Remove at least 25mm of material from the lower end of the tube. Use this material for soil description in accordance with Practice ASTM D 2488. Measure the overall sample length. Seal the lower end of the tube and carefully transported to the laboratory. Storage of sealed samples was done as no moisture was lost during storage, that is, no evidence of partial drying of the ends of the samples or shrinkage. Time of storage was minimized, particularly when the soil or soil moisture was expected to react with the sample tubes.

Summary of Test Method In this test method, the soil specimen is restrained laterally and loaded axially with total stress increments. Each stress increment is maintained until excess pore water pressures are completely dissipated. During the consolidation process, measurements are made of change in the specimen height and these data are used to determine the relationship between the effective stress and void ratio or strain, and the rate at which consolidation can occur by evaluating the coefficient of consolidation. The data from the consolidation test are used to estimate the magnitude and rate of both differential and total settlement of a structure or earth-fill. Estimates of this type are of key importance in the design of engineered structures and the evaluation of their performance. The test results can be greatly affected by sample disturbance. Careful selection and preparation of test specimens is required to minimize disturbance. Consolidation test results are dependent upon the magnitude of the load increments. Traditionally, the load is doubled for each increment resulting in a load- increment ratio of 1. The apparatus in general use for this test method does not have provisions for verification of saturation. Most undisturbed samples taken from below the water table may be saturated. This test method uses conventional consolidation theory based on Terzaghi's consolidation equation to compute the coefficient of consolidation, cv .

The analysis is based upon the following assumptions:

a) The soil is saturated and has homogeneous properties;
b) The flow of pore water is in the vertical direction;
c) The compressibility of soil particles and pore water is negligible compared the compressibility of the soil skeleton;
d) The stress-strain relationship is linear over the load increment;
e) The ratio of soil permeability to soil compressibility is constant over the load increment; and
f) Darcy ' s law for flow through porous media applies.

Specimen Preparation All possible precautions were taken to minimize disturbance of the soil or changes in moisture and density during specimen preparation. Avoid vibration, distortion, and compression. Prepared test specimens in an environment where soil moisture change during preparation was minimized. Trimmed the specimen and insert it into the consolidation ring. Carefully insert the specimen into the consolidation ring, by the width of the cut, with a minimum of force. All fibrous soils, such as peat, and those soils that are easily damaged by trimming, were transferred directly from the sampling tube to the ring, provided that the ring has the same diameter as the sample tube.

Test Results The test data were and developed the graphical presentation of void ratio verses log effective stresses and presented on Plates 20 thru 23. The computation and summarized **(Cc)** Compression Index, **(av)** Coefficient of Compression, **(m_v)** Coefficient of Volume Compressibility, **(Cv)** Coefficient of Consolidation, **(Pc)** Preconsolidation Pressure and **(K)** Coefficient of Permeability, presented on Data Plate 20 thru 23.

Compression Index **(Cc)** were calculated from the consolidation data by the following equation:

$$Cc = (e_1 - e_2)/(\log \sigma\gamma_2 - \log \sigma_1)$$

Coefficient of Compression **(a_v)** were calculated from the consolidation data by the following equation:

$$a_v = (e_1 - e_2) / (\sigma_2 - \sigma_1)$$

Coefficient of Volume Compressibility **(m_v)** and also called modulus of compressibility were calculated from the consolidation data by the following equation:

$$m_v = [(e_1 - e_2) / (\sigma_2 - \sigma_1)]/ (1+e_o) \text{ or } a_v / (1+e_o) \text{ or } (\delta e/ \delta\sigma) x[1/(1+e_o)]$$

Where: $e_1 - e_2$ are the void ratio at 1 and 2 stage of loading.

$\sigma_2 - \sigma_1$ are the effective stresses at 1 and 2 stage of loading.

Preconsolidation Pressure (Pc) was computed on each curves and construction were illustrated. The sketch is self explanatory and the preconsolidation pressures are tabulated on Plates 20 thru 23. Coefficient of Permeability (K) The coefficient of permeability of a fine grained soil may be indirectly determined by the consolidation test data. Coefficient of permeability can be calculated by the following equation:

$$C_v = k(1+e_o) / (a_v\gamma_w) = k / (m_v\gamma_w)$$

Or

$$k = C_v m_v \gamma_w$$

Unconsolidated Undrained Triaxial Test (UU) ASTM D-2850

The purpose of this laboratory is to determine the unconfined compressive strength of a cohesive soil sample. We will measure this with the unconfined compression test, which is an unconsolidated undrained (UU or Q-type) test where the lateral confining pressure is equal to zero (atmospheric pressure). As stated in ASTM D-2850.

Applied the axial load to produce axial strain at a rate of approximately 1 %/min for plastic materials that achieve maximum deviator stress at approximately 3 to 6 % strain. At these rates, the elapsed time to reach maximum deviator stress will be approximately 15 to 20 min. Continue the loading to 15 % axial strain, except loading may be stopped when the deviator stress has peaked then dropped 20 % or the axial strain has reached 5 % beyond the strain at which the peak in deviator stress occurred. Recording load and deformation values to three significant digits at about 0.1, 0.2, 0.3, 0.4, and 0.5 % strain; then at increments of about 0.5 % strain to 3 %; and, thereafter at every 1 %. Took sufficient readings to define the stress-strain curve; hence, more frequent readings may be required in the early stages of the test and as failure is approached. The curves of Unconsolidated Undrained Triaxial test result are presented on Plate UU.

Chemical Tests Chemical tests included determination of the carbonate content of soils (ASTM D 4373), Carbonate content, which provides an indication of the potential for carbonate leaching, was estimated for selected samples by determining the percentage of material soluble in a dilute solution of hydrochloric acid. Results of these tests are considered in classification of soil and are presented on the boring logs.

Liquefaction of Standard Sands and Gravels:

Liquefaction is define as landslide or flowing of natural slopes of saturated which triggered by minor forces and resembles from initial slopes of about 20^0 may try come to rest on flat slopes of 4^0 or less. Saturated sandy soils in a loose to medium dense condition were liquefied during earthquakes varying in magnitude from 5.5 to 8.5 [Richter scale] and at epicenter distance ranging from several miles to hundred miles. Most of the liquefaction of sands occurred under such condition D_{50} < 2mm and C_u < 10. the effective overburden pressure may be less than 2.0 kg/cm^2, D_r < 75 % and no fine-grained soil strata lay above the saturated sands.

Japanese Engineers have made a detailed study of the relationship between soil, foundation condition and building performance in zone c (heavy damage). Variation of Standard Penetration Resistance (SPT N-Value) with depth falls within the shaded envelop of liquefaction is important of concern. The results of similar study to determine the relationship between depths of pile, penetration resistance of the sub-surface material at the pile tip and extent of damage for pile supported structures. If we install pre-cast or caste in-situ pile 45 to 60 feet long than as per site analyses no chances of damage in term of liquefaction.

FOUNDATION ANALYSES and RECOMMENDATIONS

Foundation Design Criteria. A suitable foundation for any structure must satisfy two basic independent criteria with respect to the underlying foundation soils. First, the foundations should have an adequate factor of safety with respect to the shear strength of the supporting soils. Second, the vertical movement of the footings due to settlement or swelling of the foundation soils should be within the tolerable limits for the structures. The structural loads from the new facility may be supported on shallow foundations provided our recommendations for site preparation, foundation construction and protection are followed.

Subsurface soils at the site, in their existing condition, are considered not suitable to support the proposed new facilities on shallow foundations. The new facilities may be supported either on natural soils or on deep foundations. Our foundation analyses presented in this section are for foundations bearing on natural existing soils.

Foundation Types. We understand that Japan Port Consultants Ltd is planning for **Urgent Shift Of Ferry Terminal, Dili Port Project** of Jetty, which provides loading / unloading facilities, estimated and design loads through shallow foundations or piles. The type of foundation for a particular structure should be decided based on the subsurface stratigraphy and comparative economic and construction considerations. Therefore Piles can serve the purpose with stability.

Deep Foundations Pre-cast and Drilled Piers

General. Drilled piers derive their resistance to compressive (downward) and tensile (uplift) forces from skin friction acting on the foundation shaft. The following sections discuss design recommendations for drilled piers in granular soils.

Method of Analysis for Drilled Pier capacity. The ultimate compressive capacity, Q, for a given drilled pier penetration is taken as the sum of the skin friction on the pier wall, Q_s, and the end bearing on the pier tip, Q_p, so that:

$$Q = Q_s + Q_p = fA_s + qA_p$$

Where A_s and A_p represent, respectively, the embedded surface and pier end area; f and q represent, respectively, the unit skin friction and unit end bearing. When computing ultimate tensile capacity, the end bearing term in the above equation is neglected. Ultimate Pile Capacity and depth of pile plots for 0.4m and 1.0m diameter Pipe and Bored caste-insitu concrete piles are presented on Plates 24a thru 25d.

Strength Parameters. Design soil parameters are based on grain size, material type, SPT N-values of soil, water depth, carbonate content, density and laboratory test results.

Unit Skin Friction. We recommend computing the unit skin friction in the granular soils using the procedure described by Tomlinson (1991) as follows:

$$f_{sz} = K_s P_o \tan \delta$$

Where: f_{sz} = ultimate unit side resistance at depth z;

P_o = average effective vertical stress in soil up to depth z;

δ = angle of friction between soil and pile = ¾ ϕ; and

K_s = coefficient of horizontal stress;

ϕ = angle of internal friction.

End Bearing. The end bearing of drilled shafts in soil can be computed using the following equation as described by Tomlinson (1991).

$$q_{ult} = q_b A$$

Where: q_{ult} = ultimate end bearing;

A = cross-sectional area of the pile base; m^2; and

q_b = ultimate unit base resistance**.**

Values of q_b as presented in Tomlinson (1991) for a pile tip movement of 5 percent of the pile diameter are as follows:

for loose sand, q_b = 0

for medium dense sand, q_b = 1,530 kN/m^2

for dense sand, q_b = 3,830 kN/m^2

For drilled shafts bearing on rock the ultimate unit base resistance can be calculated using the following equation:

$q_b = 2\ N\phi\ q_{uc}$ <UCS of rock or concrete whichever is less

where: $N\phi$ = $\tan^2 (45 + \phi/2)$;

q_{uc} = unconfined compressive strength of rock; and

ϕ = angle of friction between rock and concrete.

Lateral Capacity. For drilled piers embedded in sandy soils along the transmission line, the lateral resistance should be calculated using the Broms (1964) equation as follows:

$$P = \frac{0.5\gamma D L^3 K_p}{(e+L)}$$

where: P = ultimate lateral resistance (kN);

γ = effective soil unit weight, kN/m^3;

D = pile diameter, m;

L = pile length, m;

K_p = passive pressure coefficient; and

e = eccentricity of applied load, m.

SITE PREPARATION

General. Fill and excavation will be required at the site for the construction of foundations. We recommend all fill placement and compaction be done in accordance with our recommendations presented in this and subsequent sections.

Fill Characteristics. Clean sand is considered a good fill material. Ideally, fill should consist of sand with less than 12 percent passing No. 200 sieve. However, sand containing between 12 and 30 percent fines may also be used. The minus No.40 sieve fraction should have a liquid limit less than 25 and a plasticity index less than 8. Silty gravel or gravel, sand and silt mixture is also considered a suitable fill material.

Compaction Equipment. The procedures used for fill placement and compaction generally depend upon the material used and equipment available. Granular fill should be compacted using a vibratory roller. A 10-tonne vibratory roller is generally suitable for compacting granular soils, but large quantities of water may be needed to facilitate compaction. The lift thickness of fill should be limited to 0.2 m, loose measure.

Structural and General Fill. Fill placed in paved areas or below specific facilities should be compacted in accordance with recommendations given below for structural fill. Fill placed for landscaping purposes is considered general fill. Structural and general fill should be compacted to the applicable average in situ densities given below.

Clean sand should be compacted to the following relative densities based on limiting densities determined in accordance with ASTM D-4253 and D-4254. Sand containing less than 12 percent passing 0.075-mm (No. 200) sieve is considered clean sand.

- structural fill consisting of clean sand should be compacted to an average relative density of 75 percent with no test less than 70 percent, and
- general fill consisting of clean sand should be compacted to an average relative density of 70 percent with no test less than 65 percent.

The following criteria apply to fill containing greater than 12 percent passing the 0.075 mm (No. 200) sieve.

- structural fill should be placed slightly wet of optimum moisture content and compacted to 95 percent of maximum dry density determined in accordance with ASTM D 1557-78 (modified Proctor); and
- general fill should be compacted to 90 percent of maximum dry density determined in accordance with ASTM D 1557-78 (modified Proctor).

Placement Control. Fill placement and compaction can be monitored by a nuclear density gage, or sand cone density test. Dry densities and moisture contents may be determined by any one of these tests. Selection of the appropriate procedure will depend upon the types of fill material and expertise of the personnel performing the quality control.

Excavation Stability. Excavations for below-grade facilities can be performed using sheeted vertical cuts or open-cut procedures. While open-cut methods of completing excavations are considered generally satisfactory for shallow below-grade structures, we believe they may not be feasible for deeper-seated facilities. These excavations will require increased space to accommodate side slopes. We recommend temporary side slopes in natural material cut areas should not exceed 2.0-horizontal to 1.0-vertical. Therefore, vertically cut excavations retained by using conventional sheeting may be an effective method of excavating for deeper-seated below-grade structures.

Although other types of excavation sheeting are appropriate, conventional interlocking steel sheet piling is commonly used in site development to retain vertically cut excavations.

FOUNDATION CONSTRUCTION AND PROTECTION CONSIDERATIONS

Wind and Water Erosion Clean sand backfill placed outside the structures should be protected against wind and water erosion. Recommendations for marl cap are given for the site preparation, Marl which consist of silty sands or sandy silts with limestone fragments/coralline sand is frequently used as a fill material in the embedment region.

The natural cementation properties of this material when compacted to 90 percent of the maximum dry density determined in accordance with ASTM provides adequate resistance to wind and water erosion. Other alternatives for wind and water erosion protection include asphalt paving and planned landscaping.

Compaction The procedures used for fill placement and compaction generally depend upon the material used and equipment available. Granular fill should be compacted using a vibratory roller.

A 10-tonne vibratory roller is generally suitable for compacting granular soils, but large quantities of water may be needed to facilitate compaction. The lift thickness of fill should be limited to 0.30 m, loose measure. When the fill is compacted with small vibratory rollers or hand-guided plate tampers in trenches etc., the lift thickness should be limited to 0.15 m, loose measure.

Chemical Attack of Buried Concrete.

Buried reinforced concrete may be susceptible to deterioration by chemical attack if the chemicals are in solution form and above a certain concentration. The two major types of chemical attack are due to sulphate and chloride concentrations in the foundation soils.

We recommend to use Type I cement modified with micro silica along with the super plasticizer and corrosion inhibitors for all below grade concrete at the site, to provide protection against both sulphate attack on concrete and chloride induced corrosion of reinforcing steel.

To minimize corrosion potential the concrete mix should be designed using a water-cement ratio not greater than 0.45. Admixtures may be required to provide workability. Concrete should be densified using vibrators and a cover of not less than 75 mm provided over all reinforcing steel embedded in foundation concrete.

Carbonate Leaching

Carbonate leaching is considered a significant foundation design factor if:

1) soils above groundwater level contain more than 20 percent carbonates; and

2) conditions are present that may lead to long-term percolation of water through the carbonate-enriched foundation soils.

Carbonate leaching occurs when the soluble salts present in soils above groundwater are dissolved by relatively fresh water percolating through the carbonate enriched soils. This leaching of carbonates eventually weakens the original soil structure leading to foundation distress.

Based on our laboratory test results, the carbonate content of the soils above ground water level at the site is greater than 20 percent. Therefore, protection against carbonate leaching due to possible percolation of water from rainfall, leaking pipes, and irrigation is warranted at this site.

We recommend that an impermeable membrane, such as Visqueen, be placed around building perimeters to a distance of approximately 1.5 m beyond the edge of the foundations and be sloped away from structures to provide drainage. Alternatively, placing 1.5 m wide concrete or asphalt apron around structures is considered satisfactory. Plantation around the building perimeters to a lateral distance of 1.5 m should be avoided.

LIMITATION

This report and analysis are based on the limited extent of soil exploration work. However during the excavation of foundation if considerable departure of reported soil strata are observed, the matter be reported to us for further advice.

The following illustrations are attached and complete this report.

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Illustrations

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Samples Photo Graph	Appendix-C

We appreciate being of service to **Urgent Shift Of Ferry Terminal, Dili Port Project** in Republic of Timor Leste, with the **Japan Port Consultants Ltd.** Please call us if you have any further questions and assistance.

Sincerely,

Prof. {Dr} Gulam Murtaza
Principal Geotechnical Manager
Ph D in Geotechnical Engineering, Roorkee
M.E in Soil Mechanics and Foundation Eng. Roorkee
Ex Head- Soil Mechanics & Foundation Engineering, AMU
Life Member of Roorkee University Alumni Association
Member of Indian Geotechnical Society
M I S of Soil Mechanics and Foundation Engineers

Geotechink Ltd.

Syed Abbas Murtaza
Project Manager

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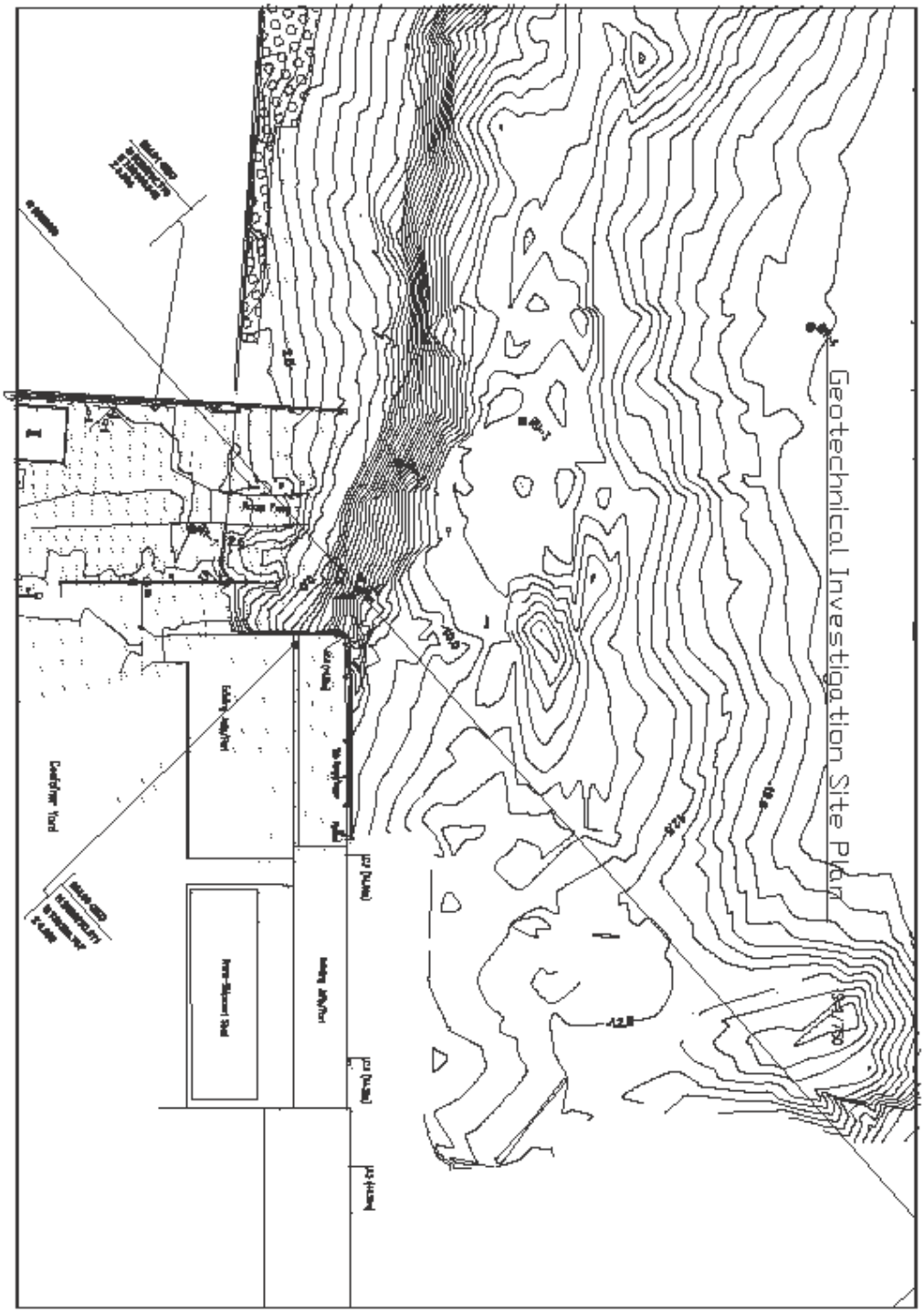
ILLUSTRATION

VICINITY MAP
Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT
TIMOR LESTE

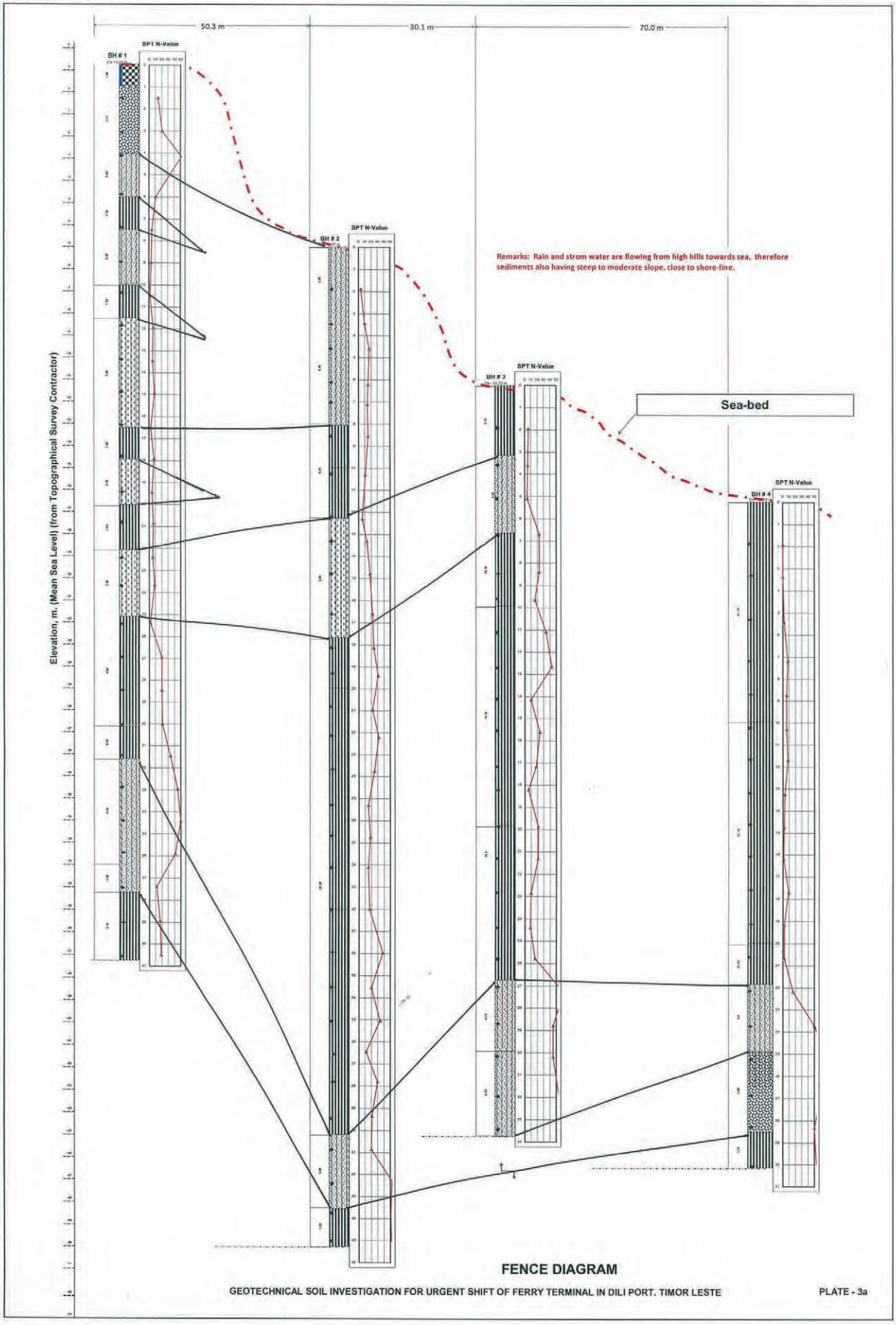
PLATE - 1



PLAN OF FIELD TESTs

Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT
TIMOR LESTE

PLATE - 2



FENCE DIAGRAM

GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT. TIMOR LESTE

PLATE - 3a

Geotechnik Ltd

geotechnical and material engineers

BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD

PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE

BORING NO. BH # 1

CO-ORDINATE (M) X= 783,172.82 | **DIAM: 96 mm** | **SHEET: 1 OF 5**

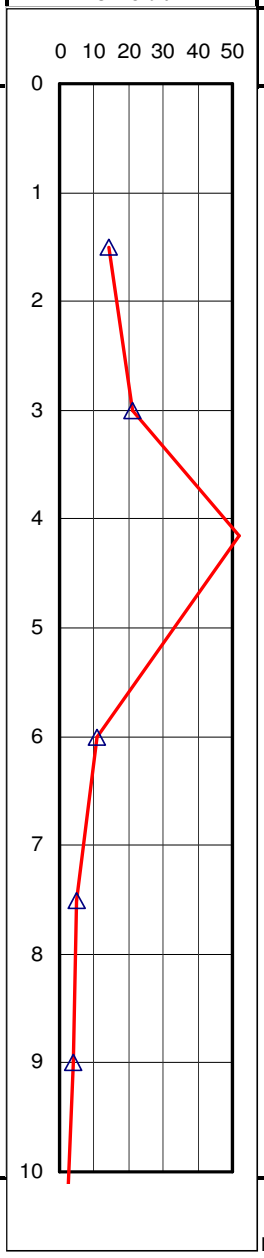
Y= 9,053,780.58 | **Location: On-shore**

Ground Elevation (m) = + 3.31 | **Date of Commencement: 18 July 2015**

Depth (m): 40.50 | **Date Completed: 24 July 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
1		1.00	1.00		**Filled up Boulder, cobble, Gravel and sand matrix**						Rec. 17% RQD 0
2		4.15	3.15		Medium dense dark grey Sandy well graded **GRAVEL (GW)** (Gravels are subrounded, subangular Quartz)	1.5	5	6	8	14	S-1 **1.05-1.50**
					- whitish dark grey Sandy well graded **GRAVEL** with Silt **(GW-GM)** to 2.55 m	3.00	8	10	11	21	S-2 **2.55-3.00**
					- very dense whitish light grey below 4.00 m	4.15	52			52	S-3 **4.00-4.15**
3		6.00	1.85		Medium dense dark grey Silty fine to coarse SAND with Gravel **(SM)** (Gravels are subrounded, subangular Quartz)	6.00	4	5	6	11	S-4 **5.55-6.00**
4		7.50	1.50		Loose dark grey calcareous **SILT** with little Sand **(ML),** with low plasticity	7.50	1	2	3	5	S-5 **7.05-7.50**
5		10.00	2.50		Very loose light grey carbonate Silty, Gravelly fine to coarse **SAND (SM)** (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	9.00	1	2	2	4	S-6 **8.55-9.00**
					10.00 m						

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 3a

Geotechnik Ltd

geotechnical and material engineers

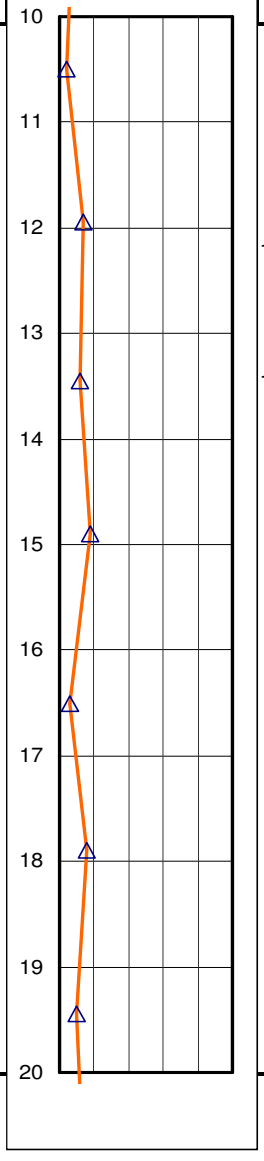
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 1**
CO-ORDINATE (M) X= 783,172.82	**DIAM: 96** mm		**SHEET: 2 OF 5**
Y= 9,053,780.58			**Location: On-shore**
Ground Elevation (m) = + 3.31			**Date of Commencement: 18 July 2015**
Depth (m): 40.50			**Date Completed: 24 July 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
6		11.50	1.50		Very loose whitish grey carbonate **SILT** with Sand & Gravel **(ML),** with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	10.50	3	1	1	2	S-7 **10.05-10.5**
7		16.50	5.00		Loose whitish light grey carbonate Silty well graded **GRAVEL** with Sand **(GW)** (Gravels are **coral and shell fragments** interbedded with Silt and Sand layers)	11.95	10	4	3	7	S-8 **11.50-11.95**
						13.45	3	3	3	6	S-9 **13.0-13.45**
					- very loose below 14.90 m	14.90	2	4	5	9	S-10 **14.45-14.9**
						16.50	2	1	2	3	S-11 **16.05-16.5**
8		17.90	1.40		Loose whitish grey carbonate Gravelly **SILT** with Sand **(ML)**, with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	17.90	5	4	4	8	S-12 **17.45-17.9**
9		20.00	2.10		Loose greyish white carbonate Silty well graded **GRAVEL** with Sand **(GW)** (Gravels are **coral and shell fragments** interbedded with Silt and Sand layers)	19.45	7	3	2	5	S-13 **19.0-19.45**
					20.00 m						

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 3b

Geotechnik Ltd

geotechnical and material engineers

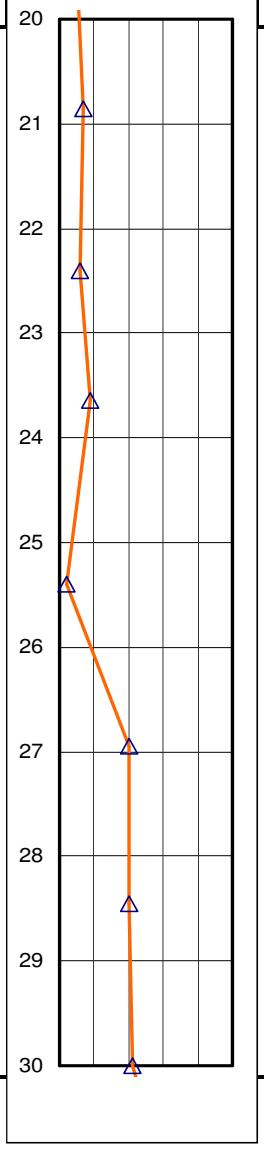
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD		
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE		BORING NO. BH # 1
CO-ORDINATE (M) X= 783,172.82	DIAM: 96 mm	SHEET: 3 OF 5
Y= 9,053,780.58		Location: On-shore
Ground Elevation (m) = + 3.31		Date of Commencement: 18 July 2015
Depth (m): 40.50		Date Completed: 24 July 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
10		21.95	1.95		Loose light grey carbonate **SILT** with Sand and Gravel **(ML)**, with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	20.85	5	3	4	7	S-14 **20.4-20.85**
					21.95 m						
11		24.95	3.00		Loose whitish grey carbonate well graded **GRAVEL** with Silt **(GW-GM)** (Gravels are **coral and shell fragments** interbedded with Silt and Sand layers)	22.40	5	4	2	6	S-15 **21.95-22.4**
						23.85	5	4	5	9	S-16 **23.4-23.85**
12		30.00	6.50		Very loose dark grey carbonate **SILT** with Sand and Gravel **(ML)**, with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	25.40	4	1	1	2	S-17 **24.95-25.4**
					- medium dense grey carbonate **SILT** with fine Sand **(ML),** 26.50 to 28.00 m	26.95	7	8	12	20	S-18 **26.5-26.95**
					- medium dense dark grey carbonate **SILT (ML)** with low to moderate plasticity**,** 26.50 to 28.00 m	28.45	6	8	12	20	S-19 **28.0-28.45**
					30.00 m	30.00	6	9	13	22	S-20 **29.55-30.0**

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 3c

Geotechnik Ltd

geotechnical and material engineers

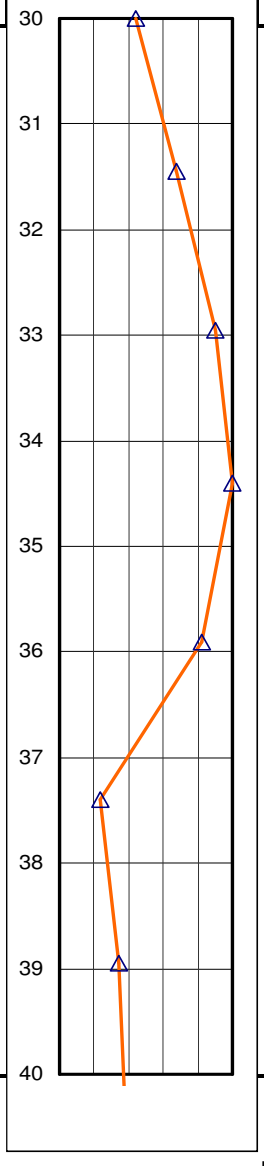
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			BORING NO. BH # 1
CO-ORDINATE (M) X= 783,172.82	DIAM: 96 mm		SHEET: 4 OF 5
Y= 9,053,780.58			Location: On-shore
Ground Elevation (m) = + 3.31			Date of Commencement: 18 July 2015
Depth (m): 40.50			Date Completed: 24 July 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
12		31.45	6.50		Dense grey carbonate Sandy **SILT (ML)**, with low plasticity	31.45	5	10	24	34	S-21 **31.0-31.45**
13		35.90	4.45		Dense whitish light grey carbonate Silty, Gravelly fine to coarse **SAND (SM)** (Coralline Sand with coral and shell fragments and flacky Quartz)	32.95	12	22	23	45	S-22 **32.5-32.95**
						34.40	13	22	28	50	S-23 **33.95-34.4**
						35.90	14	20	21	41	S-24 **35.45-35.9**
14		37.40	1.50		Medium dense dark grey Silty, Gravelly fine to coarse **SAND (SM),** Gravels are sub-rounded to sub-angular Quartz	37.40	3	4	8	12	S-25 **36.45-37.4**
15		40.00	3.10		Medium dense dark grey **SILT (ML)**, with moderate to high plasticity -3.1	38.95	5	9	8	17	S-26 **38.5-38.95**
					40.00 m						

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 3d

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD					
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE				BORING NO. BH # 1	
Sample #	Depth (m)	Moisture Contant (%)	Wet Density (Kg/m3)	Dry density (Kg/m3)	Spesific Gravity
S-1	1.50	7.5	1929	1795	2.62
S-2	3.00	.-.-.	.-.-.	.-.-.	.-.-.
S-3	4.15	4.8	.-.-.	.-.-.	2.61
S-4	6.00	.-.-.	.-.-.	.-.-.	.-.-.
S-5	7.50	37.3	.-.-.	.-.-.	2.32
S-6	9.00	42.4	1577	1107	2.26
S-7	10.50	.-.-.	.-.-.	.-.-.	.-.-.
S-8	11.95	39.6	.-.-.	.-.-.	2.21
S-9	13.45	37.4	.-.-.	.-.-.	2.28
S-10	14.90	.-.-.	.-.-.	.-.-.	.-.-.
S-11	16.50	.-.-.	.-.-.	.-.-.	.-.-.
S-12	17.90	36.6	.-.-.	.-.-.	2.31
S-13	19.45	.-.-.	.-.-.	.-.-.	.-.-.
S-14	20.85	31.2	1714	1306	2.32
S-15	22.40	.-.-.	.-.-.	.-.-.	.-.-.
S-16	23.85	29.8	.-.-.	.-.-.	2.19
S-17	25.40	28.7	.-.-.	.-.-.	2.37
S-18	26.95	33.5	1670	1251	2.29
S-19	28.45	.-.-.	.-.-.	.-.-.	.-.-.
S-20	30.00	34.5	.-.-.	.-.-.	2.29
S-21	31.45	24.7	.-.-.	.-.-.	2.46
S-22	32.95	32.6	.-.-.	.-.-.	2.60
S-23	34.40	7.4	.-.-.	.-.-.	2.60
S-24	35.90	7.3	2126	1982	2.52
S-25	37.40	.-.-.	.-.-.	.-.-.	.-.-.
S-26	38.95	41.6	.-.-.	.-.-.	2.21
S-27	40.50	39.2	2143	1540	2.20

PLATE 3f

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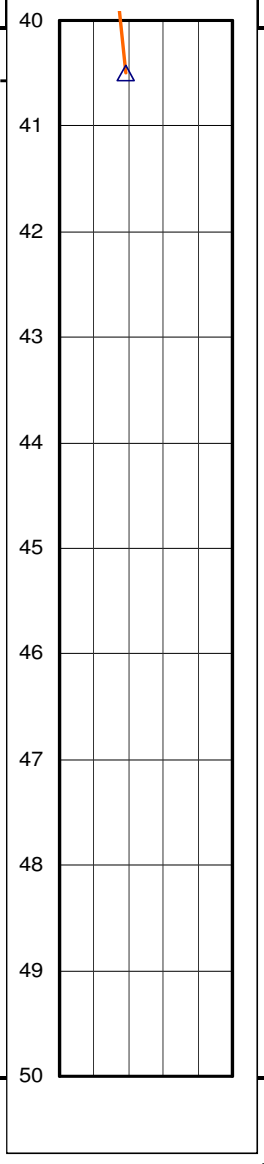
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			BORING NO. BH # 1
CO-ORDINATE (M) X= 783,172.82	DIAM: 96 mm		SHEET: 5 OF 5
Y= 9,053,780.58			Location: On-shore
Ground Elevation (m) = + 3.31			Date of Commencement: 18 July 2015
Depth (m): 40.50			Date Completed: 24 July 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	SPT Chart	Sample No. / Depth of the Sample
15		40.50	3.10		Medium dense dark grey **SILT (ML)**, with moderate to high plasticity	40.50	2	7	12	19		S-27 40.05-40.5
					40.50 m							
					- medium							



Contineous Corig Rock Sample
SPT Representative Sample
Thin Wall Tube Sample

PLATE - 3e

Geotechnik Ltd

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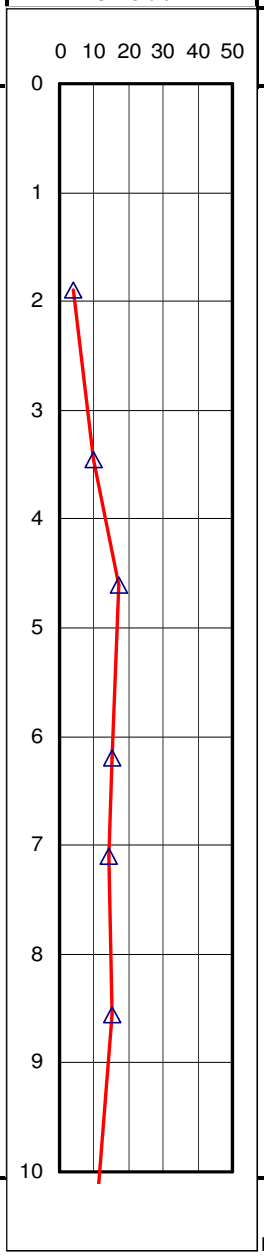
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 2**
CO-ORDINATE (M) X= 783,193.37	**DIAM: 96 mm**		**SHEET: 1 OF 5**
Y= 9,053,826.49			**Location: Off-shore**
Ground Elevation (m) = - 5.02			**Date of Commencement: 28 July 2015**
Depth (m): 45.05			**Date Completed: 24 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
1		3.00	3.00		Very loose grey Silty fine to coarse **SAND** with little Gravel **(SM),** (Gravels are subrounded, subangular Quartz)	1.90	5	2	2	4	S-1 **1.45-1.90**
					3.00 m						
2		8.10	5.10		Very loose to medium dense grey carbonate Silty fine to coarse **SAND** with Gravel **(SM)** (Gravels are coral and shell fragments interbedded with Silt and Sand layers, Quartz and Sanstone)	3.45	1	4	6	10	S-2 **3.00-3.45**
						4.60	7	8	9	17	S-3 **4.15-4.60**
					- loose to 4.15 m						
					- medium dense below 4.15 m	6.20	7	7	8	15	S-4 **5.76-6.20**
						7.10	4	6	8	14	S-5 **6.65-7.10**
					8.10 m						S-6 **8.10-8.55**
3		10.00	4.20		Medium dense dark grey carbonate **SILT** with Sand & little Gravel **(ML),** with low plasticity (Gravels are coral and shell fragments)	8.55	7	6	9	15	
					10.00 m						

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 4a

Geotechnik Ltd

geotechnical and material engineers

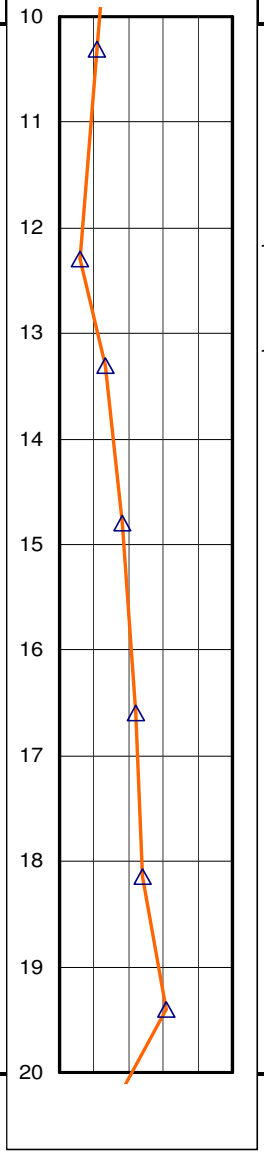
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD		
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE		BORING NO. BH # 2
CO-ORDINATE (M) X= 783,193.37	DIAM: 96 mm	SHEET: 2 OF 5
Y= 9,053,826.49		Location: Off-shore
Ground Elevation (m) = - 5.02		Date of Commencement: 28 July 2015
Depth (m): 45.05		Date Completed: 24 August 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
3		12.30	4.20		Loose to medium dense dark grey carbonate **SILT** with Sand & Gravel **(ML),** with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers) - medium dense to 10.30 m - loose below 10.30 m **12.30 m**	10.30	3	5	6	11	S-7 **9.85-10.30**
						12.30	3	2	4	6	S-8 **11.85-12.3**
4		17.70	5.40		Medium dense light grey carbonate Sandy well graded **GRAVEL** with Silt **(GW-GM)** (Gravels are **coral and shell fragments** interbedded with Silt and Sand layers) **17.70 m**	13.30	7	5	8	13	S-9 **12.85-13.3**
						14.80	9	7	11	18	S-10 **14.35-14.8**
						16.60	11	9	13	22	S-11 **16.15-16.6**
5		20.00	22.30		Medium dense light grey carbonate **SILT** with Sand & little Gravel **(ML)**, with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers) - Gravelly **SILT** with Sand **(ML)** below 18.95 m **20.00 m**	18.15	12	11	13	24	S-12 **17.7-18.15**
						19.40	13	15	16	31	S-13 **18.95-19.4**

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 4b

Geotechnik Ltd

geotechnical and material engineers

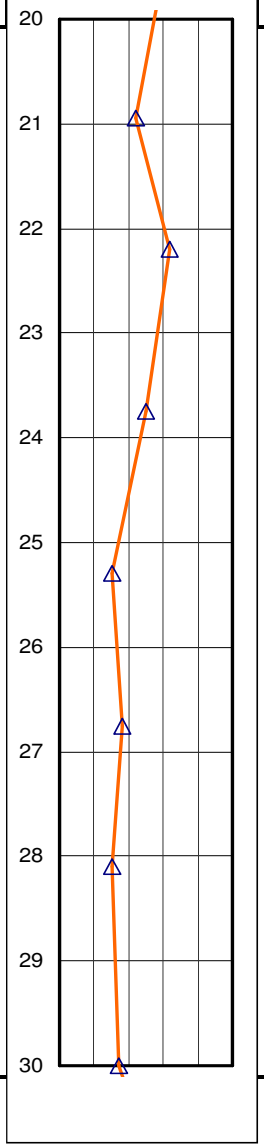
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 2**
CO-ORDINATE (M) X= 783,193.37	**DIAM: 96 mm**		**SHEET: 3 OF 5**
Y= 9,053,826.49			**Location: Off-shore**
Ground Elevation (m) = - 5.02			**Date of Commencement: 28 July 2015**
Depth (m): 45.05			**Date Completed: 24 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
5		30.00	22.30		Medium dense to dense light grey calcareous **SILT (ML)**, with high to moderate plasticity (Gravels are coral and shell fragments interbedded)	20.95	7	9	13	22	S-14 **20.5-20.95**
					- medium dense to 21.75 m	22.20	11	17	15	32	S-15 **21.75-22.2**
					- dense, 21.75 to 23.30 m	23.75	9	13	12	25	S-16 **23.3-23.75**
					- dark grey medium dense below 23.30 m	25.30	8	7	8	15	S-17 **24.85-25.3**
						26.75	7	9	9	18	S-18 **26.3-26.75**
						28.10	7	4	11	15	S-19 **27.65-28.1**
					30.00 m	30.00	6	8	9	17	S-20 **29.55-30.0**

SPT Chart



■ **Contineous Corig Rock Sample**

● **SPT Representative Sample**

■ **Thin Wall Tube Sample**

PLATE - 4c

Geotechnik Ltd

geotechnical and material engineers

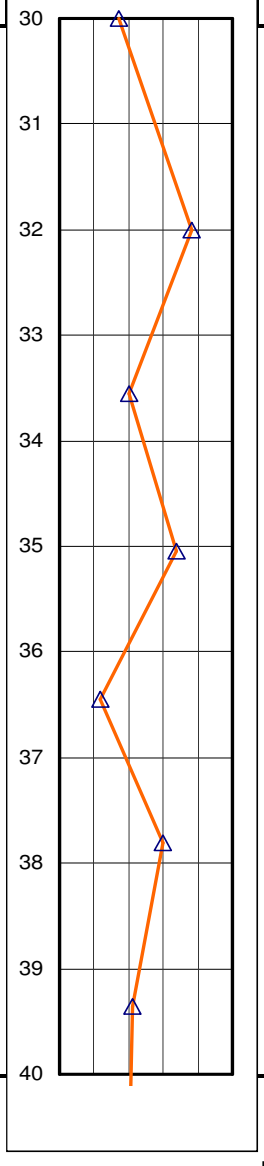
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			BORING NO. BH # 2
CO-ORDINATE (M) X= 783,193.37	DIAM: 96 mm		SHEET: 4 OF 5
Y= 9,053,826.49			Location: Off-shore
Ground Elevation (m) = - 5.02			Date of Commencement: 28 July 2015
Depth (m): 45.05			Date Completed: 24 August 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
5		40.00	22.30		Medium dense to dense dark grey calcareous **SILT (ML)**, with high to moderate plasticity (Gravels are coral and shell fragments interbedded)						
					- dense to 32.0 m	32.00	20	19	19	38	S-21 **31.55-32.0**
					- medium dense, 32.0 to 34.60 m	33.55	6	8	12	20	S-22 **33.1-33.55**
					- dense, 34.60 to 36.00m	35.05	12	16	18	34	S-23 **34.6-35.05**
						36.45	7	4	8	12	S-24 **36.0-36.45**
						37.80	6	13	17	30	S-25 **37.35-37.8**
						39.35	8	9	12	21	S-26 **38.9-39.35**
					40.00 m						

SPT Chart



Contineous Corig Rock Sample
SPT Representative Sample
Thin Wall Tube Sample

PLATE - 4d

Geotechnik Ltd

geotechnical and material engineers

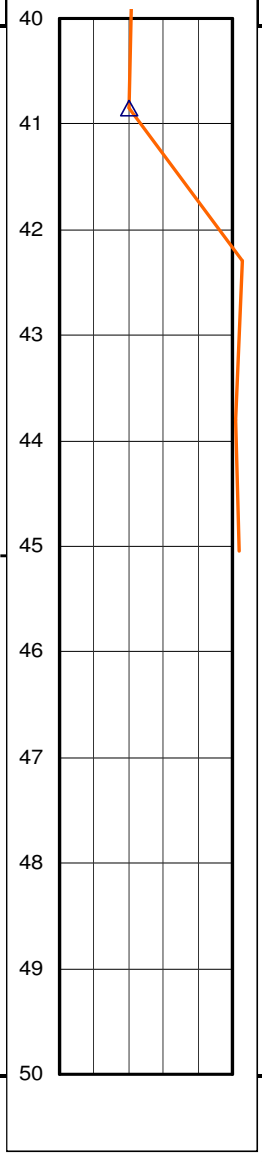
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			BORING NO. BH # 2
CO-ORDINATE (M) X= 783,193.37	DIAM: 96 mm		SHEET: 5 OF 5
Y= 9,053,826.49			Location: Off-shore
Ground Elevation (m) = - 5.02			Date of Commencement: 28 July 2015
Depth (m): 45.05			Date Completed: 24 August 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
6		43.80	3.80		Medium dense to very dense dark brownish grey Silty, Gravelly fine to coarse **SAND (SM)**, (Gravels are Quartz & Phylite)	40.85	13	9	11	20	S-27 40.4-40.85
					- medium dense to 41.85 m						
					- very dense below 41.85 m	42.30	27	33	31	64	S-28 41.85-42.3
					40.50 m						
7		45.05	1.25		Very dense reddish greyish mix with brown **SILT** with Sand and little Gravel **(ML)**, with low to moderate plasticity (Gravels are Quartz & Phylite)	43.80	16	24	27	51	S-29 43.35-43.8
					- greyish light brown below 44.6 m	45.05	21	20	32	52	S-30 44.6-45.05
					- medium						

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 4e

Geotechnik Ltd

geotechnical and material engineers

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD

PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE — **BORING NO. BH # 2**

Sample #	Depth (m)	Moisture Contant (%)	Wet Density (Kg/m3)	Dry density (Kg/m3)	Spesific Gravity
S-1	1.90	17.0	2091	1787	2.60
S-2	3.45	.-.-.	.-.-.	.-.-.	.-.-.
S-3	4.60	12.2	2682	2391	2.60
S-4	6.20	.-.-.	.-.-.	.-.-.	.-.-.
S-5	7.10	22.0	2618	2145	2.40
S-6	8.55	32.2	2007	1518	2.34
S-7	10.30	.-.-.	.-.-.	.-.-.	.-.-.
S-8	12.30	30.9	2522	1926	2.28
S-9	13.30	.-.-.	.-.-.	.-.-.	.-.-.
S-10	14.80	22.3	.-.-.	.-.-.	2.40
S-11	16.60	28.8	2451	1903	2.41
S-12	18.15	.-.-.	.-.-.	.-.-.	.-.-.
S-13	19.40	28.4	2016	1570	2.40
S-14	20.95	.-.-.	.-.-.	.-.-.	.-.-.
S-15	22.20	.-.-.	.-.-.	.-.-.	.-.-.
S-16	23.75	34.6	2425	1802	2.26
S-17	25.30	.-.-.	.-.-.	.-.-.	.-.-.
S-18	26.75	33.6	1907	1427	2.28
S-19	28.10	.-.-.	.-.-.	.-.-.	.-.-.
S-20	30.00	32.6	2371	1789	2.29
S-21	32.00	40.5	2369	1686	2.21
S-22	33.55	.-.-.	.-.-.	.-.-.	.-.-.
S-23	35.05	.-.-.	.-.-.	.-.-.	.-.-.
S-24	36.45	.-.-.	.-.-.	.-.-.	.-.-.
S-25	37.80	.-.-.	.-.-.	.-.-.	.-.-.
S-26	39.35	54.3	2172	1407	2.02
S-27	40.85	.-.-.	.-.-.	.-.-.	.-.-.
S-28	42.30	17.0	2039	1743	2.47
S-29	43.80	.-.-.	.-.-.	.-.-.	.-.-.
S-30	45.05	21.5	2536	2088	2.36

PLATE 4f

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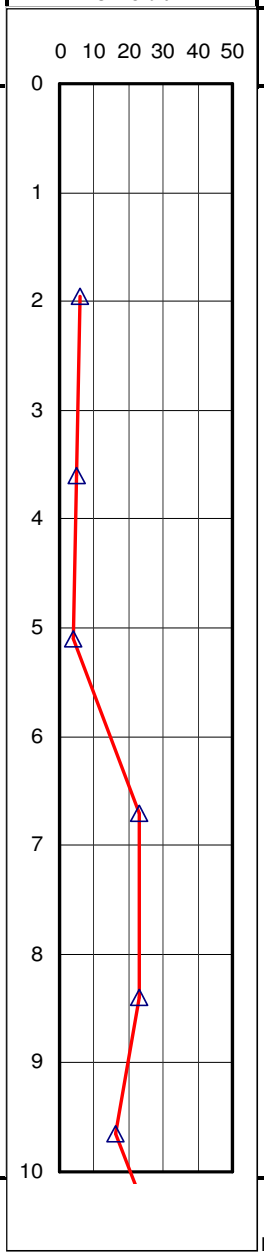
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 3**
CO-ORDINATE (M) X= 783,204.90	**DIAM: 96 mm**		**SHEET: 1 OF 4**
Y= 9,053,854.30			**Location: Off-shore**
Ground Elevation (m) = - 11.22			**Date of Commencement: 29 July 2015**
Depth (m): 33.60			**Date Completed: 04 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
1		3.15	3.15		Loose grey calcareous **SILT** with fine Sand **(ML),** with low plasticity	1.95	3	3	3	6	S-1 **1.50-1.95**
					3.15 m						
2		6.70	3.55		Very loose to loose dark grey carbonate Silty fine to medium **SAND** with little Gravel **(SM)** (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	3.60	1	2	3	5	S-2 **3.15-3.60**
					- loose to 4.65 m	5.10	2	2	2	4	S-3 **4.65-5.10**
					- very loose, 4.65 to 6.25 m						
					- medium dense Silty fine to coarse **SAND** with Gravel **(SM)** below 6.25 m	6.70	5	11	12	23	S-4 **6.25-6.70**
					6.70 m						
3		10.00	15.70		Medium dense dark grey carbonate **SILT** with fine Sand **(ML),** with low plasticity	8.40	5	11	12	23	S-5 **7.95-8.40**
					10.00 m	9.65	8	8	8	16	S-6 **9.20-9.65**

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 5a

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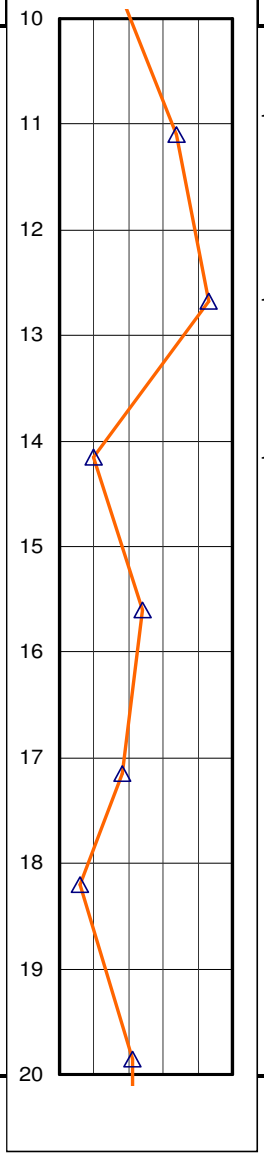
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 3**
CO-ORDINATE (M) X= 783,204.90	**DIAM: 96 mm**		**SHEET: 2 OF 4**
Y= 9,053,854.30			**Location: Off-shore**
Ground Elevation (m) = - 11.22			**Date of Commencement: 29 July 2015**
Depth (m): 33.60			**Date Completed: 04 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
3		20.00	15.70		Loose to medium dense dark grey carbonate fine Sandy **SILT (ML),** with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	11.10	12	15	19	34	S-7 **10.65-11.1**
					- medium dense to 12.22 m						
					- dense,12.22 to 13.70 m	12.67	14	20	23	43	S-8 **12.22-12.67**
					- loose, 13.70 to 15.15 m	14.15	4	5	5	10	S-9 **13.7-14.15**
					- medium dense,15.15 to 17.75 m	15.60	7	10	14	24	S-10 **15.15-15.6**
					- dark grey carbonate **SILT (ML)**, with high to moderate plasticity below 16.70 m	17.15	8	8	10	18	S-11 **16.7-17.15**
					- loose, 17.75 to 19.40 m	18.20	3	3	3	6	S-12 **17.75-18.2**
					- medium dense below 19.40 m **20.00 m**	19.85	4	9	12	21	S-13 **19.4-19.85**

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 5b

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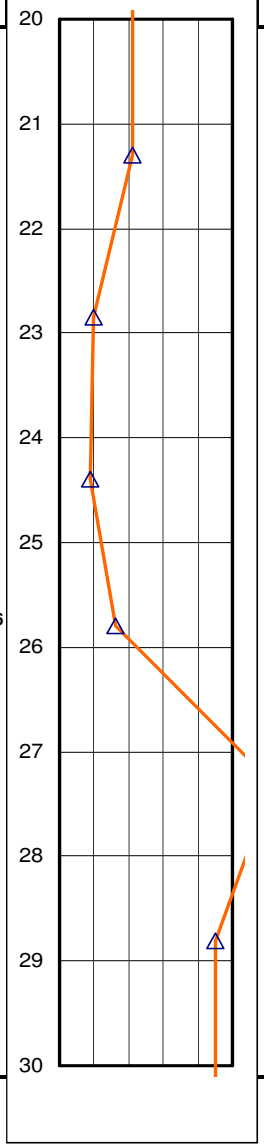
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 3**
CO-ORDINATE (M) X= 783,204.90	**DIAM: 96 mm**		**SHEET: 3 OF 4**
Y= 9,053,854.30			**Location: Off-shore**
Ground Elevation (m) = - 11.22			**Date of Commencement: 29 July 2015**
Depth (m): 33.60			**Date Completed: 04 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No.	Depth of the Sample
3		22.40	15.7		Medium dense dark grey carbonate **SILT (ML)**, with high to moderate plasticity (Gravels are coral and shell fragments)	21.30	8	11	10	21	S-14	20.85-21.3
					22.40 m							
4		26.85			Loose to medium dense dark grey calcareous **SILT (ML)**, with high to moderate plasticity	22.85	4	5	5	10	S-15	22.4-22.85
					- loose to 25.35 m	24.40	4	5	4	9	S-16	23.95-24.4
					- medium dense below 25.35 m	25.80	5	8	8	16	S-17	25.35-25.8
					26.85 m							
5		30.00	6.75		Dense to very dense light to dark greenish Silty, Gravelly fine to coarse **SAND (SM)** (Gravels are Phyllite and Quartz)	27.30	18	28	34	62	S-18	26.85-27.3
					- very dense to 28.35 m	28.80	26	21	24	45	S-19	28.35-28.8
					- dense below 28.35 m							
					30.00 m							

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 5c

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geotechnical and material engineers

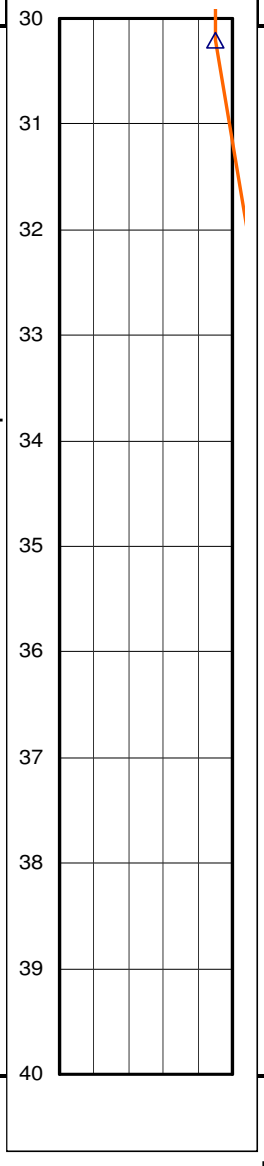
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			BORING NO. BH # 3
CO-ORDINATE (M) X= 783,204.90	DIAM: 96 mm		SHEET: 4 OF 4
Y= 9,053,854.30			Location: Off-shore
Ground Elevation (m) = - 11.22			Date of Commencement: 29 July 2015
Depth (m): 33.60			Date Completed: 04 August 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
5		33.60	6.75		Dense to very dense light to dark greenish Silty, Gravelly fine to coarse **SAND (SM)** (Gravels are Phyllite and Quartz)	30.20	25	20	25	45	S-20 **29.75-30.2**
					- dense to 31.65 m	32.10	25	27	28	55	S-21 **31.65-32.1**
					- very dense below 31.65 m						
					33.60 m	33.60	27	25	34	59	S-22 **33.15-33.6**

SPT Chart



Contineous Corig Rock Sample
SPT Representative Sample
Thin Wall Tube Sample

PLATE - 5d

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Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD

PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE — **BORING NO. BH # 3**

Sample #	Depth (m)	Moisture Contant (%)	Wet Density (Kg/m3)	Dry density (Kg/m3)	Spesific Gravity
S-1	1.95	34.9	1860	1379	2.32
S-2	3.60	30.9	1930	1475	2.36
S-3	5.10	.-.-.	.-.-.	.-.-.	.-.-.
S-4	6.70	26.4	1941	1535	2.36
S-5	8.40	.-.-.	.-.-.	.-.-.	.-.-.
S-6	9.65	30.7	1882	1440	2.25
S-7	11.10	.-.-.	.-.-.	.-.-.	.-.-.
S-8	12.67	33.5	1860	1393	2.32
S-9	14.15	.-.-.	.-.-.	.-.-.	.-.-.
S-10	15.60	.-.-.	.-.-.	.-.-.	.-.-.
S-11	17.15	34.4	1834	1364	2.23
S-12	18.20	.-.-.	.-.-.	.-.-.	.-.-.
S-13	19.85	.-.-.	.-.-.	.-.-.	.-.-.
S-14	21.30	34.8	1869	1386	2.30
S-15	22.85	.-.-.	.-.-.	.-.-.	.-.-.
S-16	24.40	42.2	1766	1242	2.14
S-17	25.80	.-.-.	.-.-.	.-.-.	.-.-.
S-18	27.30	8.3	1987	1836	2.63
S-19	28.80	.-.-.	.-.-.	.-.-.	.-.-.
S-20	30.20	9.2	1802	1651	2.56
S-21	32.10	.-.-.	.-.-.	.-.-.	.-.-.
S-22	33.60	9.3	1713	1567	2.61

PLATE 5e

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BORING LOG

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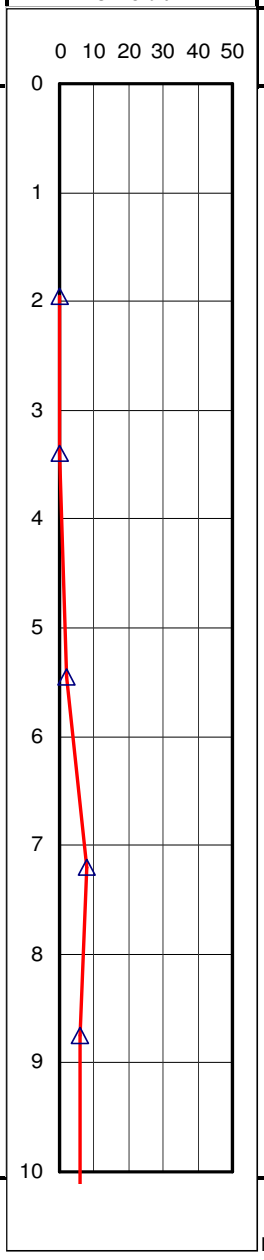
CLIENT: JAPAN PORT CONSULTANTS,LTD			
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE			**BORING NO. BH # 4**
CO-ORDINATE (M) X= 783,232.82	**DIAM: 96** mm		**SHEET: 1 OF 3**
Y= 9,053,918.49			**Location: Off-shore**
Ground Elevation (m) = - 16.63			**Date of Commencement: 12 August 2015**
Depth (m): 30.05			**Date Completed: 14 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
1		10.00	21.75		**Very loose** dark grey calcareous **SILT** with Sand **(ML)**, with low plasticity	1.95	0	0	0	0	S-1 **1.50-1.95**
						3.40	0	0	0	0	S-2 **2.95-3.40**
						5.45	1	1	1	2	S-3 **5.00-5.45**
					- loose below 6.75 m	7.2	3	3	5	8	S-4 **6.75-7.20**
						8.75	3	1	5	6	S-5 **8.30-8.75**
					10.00 m						S-6 **9.85-10.30**

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 6a

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BORING LOG

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PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE

BORING NO. BH # 4

CO-ORDINATE (M) X= 783,232.82 | **DIAM: 96 mm** | **SHEET: 2 OF 3**

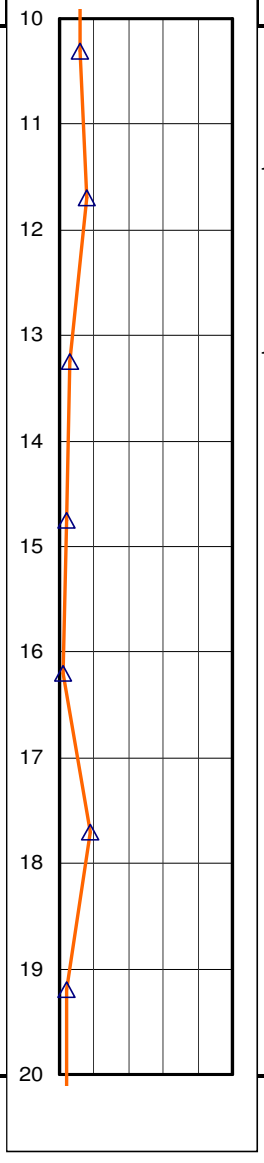
Y= 9,053,918.49 | **Location: Off-shore**

Ground Elevation (m) = - 16.63 | **Date of Commencement: 12 August 2015**

Depth (m): 30.05 | **Date Completed: 14 August 2015**

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
1		20.00	21.75		**Very loose** to loose dark grey carbonate **SILT** with Sand **(ML)**, with low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	10.30	2	2	4	6	S-6 **9.85-10.30**
					- loose to 11.70 m	11.70	3	2	6	8	S-7 **11.25-11.7**
					- very loose, 11.70 to 17.25 m - **SILT (ML)**, with high to moderate plasticity below 13.25 m	13.25	2	2	1	3	S-8 **12.8-13.25**
						14.75	1	1	1	2	S-9 **14.3-14.75**
						16.20	1	1	0	1	S-10 **15.75-16.2**
					- loose below 17.25 m	17.70	2	4	5	9	S-11 **17.25-17.7**
						19.20	1	1	1	2	S-12 **18.75-19.2**
					20.00 m						

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 6b

Geotechnik Ltd

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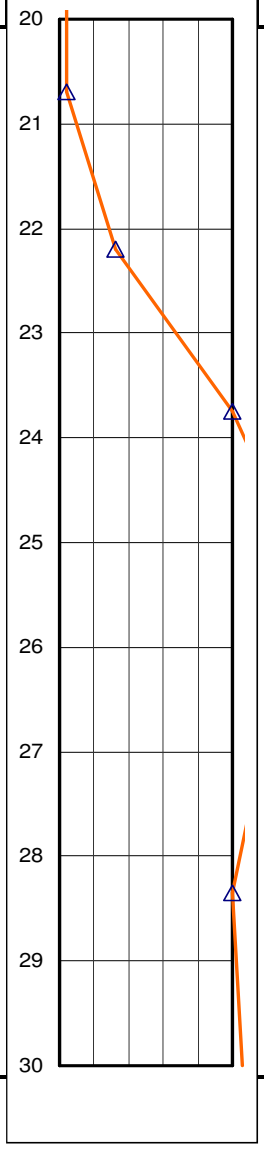
BORING LOG

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD		
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE		BORING NO. BH # 4
CO-ORDINATE (M) X= 783,232.82	DIAM: 96 mm	SHEET: 3 OF 3
Y= 9,053,918.49		Location: Off-shore
Ground Elevation (m) = - 16.63		Date of Commencement: 12 August 2015
Depth (m): 30.05		Date Completed: 14 August 2015

Layer	Elevation (m)	Depth (m)	Thickness, m	Lithological Symbol	SOIL / ROCK MATERIAL IN-SITU DESCRIPTION	Depth (m)	Blows/15 cm N_0	N_1	N_2	SPT N-Value	Sample No. / Depth of the Sample
1		21.75	21.75		Very loose dark grey carbonate Sandy **SILT (ML)**, with moderate to low plasticity (Gravels are coral and shell fragments interbedded with Silt and Sand layers)	20.70	1	1	1	2	S-13 **20.25-20.7**
					21.75 m						
2		24.75	3.0		Medium dense greyish brown Silty, Gravelly fine to coares **SAND (SM)** (Gravels are Phyllite and Quartz fragments)	22.20	6	8	8	16	S-14 **21.75-22.2**
					- medium dense to 23.30 m	23.75	31	27	23	50	S-15 **23.3-23.75**
					- dense below 23.30 m						
					24.75 m						
3		28.35	3.60		Very dense greyish brown Silty, Sandy well graded **GRAVEL (GM)** (Gravels are Phyllite and Quartz fragments)	25.20	27	32	38	70	S-16 **24.75-25.2**
					- well graded **GRAVEL** with little Sand **(GW)** below 26.35 m	26.80	39	28	32	60	S-17 **26.35-26.8**
					28.35 m	28.35	19	22	28	50	S-18 **27.9-28.35**
4		30.05	1.70		Very dense light greyish light brown **SILT** with Sand and Gravel **(ML)** with low to moderate plasticity						
					30.05 m	30.05	16	22	32	54	S-19 **29.6-30.05**

SPT Chart



Contineous Corig Rock Sample

SPT Representative Sample

Thin Wall Tube Sample

PLATE - 6c

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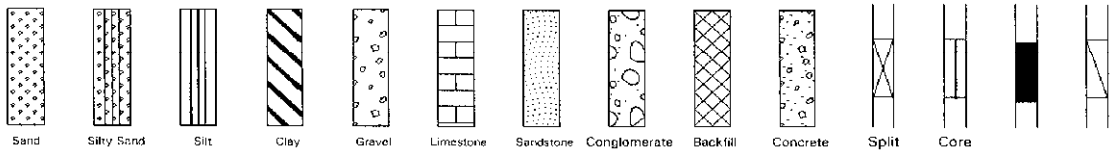
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE — **BORING NO. BH # 4**

Sample #	Depth (m)	Moisture Contant (%)	Wet Density (Kg/m3)	Dry density (Kg/m3)	Spesific Gravity
S-1	1.95	37.8	1919	1392	2.25
S-2	3.40	.-.-.	.-.-.	.-.-.	.-.-.
S-3	5.45	.-.-.	.-.-.	.-.-.	.-.-.
S-4	7.20	33.9	1904	1422	2.29
S-5	8.75	.-.-.	.-.-.	.-.-.	.-.-.
S-6	10.30	.-.-.	.-.-.	.-.-.	.-.-.
S-7	11.70	45.6	1744	1198	2.18
S-8	13.25	.-.-.	.-.-.	.-.-.	.-.-.
S-9	14.75	39.3	1830	1313	2.27
S-10	16.20	29.8	1804	1390	2.25
S-11	17.70	.-.-.	.-.-.	.-.-.	.-.-.
S-12	19.20	.-.-.	.-.-.	.-.-.	.-.-.
S-13	20.70	42.6	1793	1257	2.13
S-14	22.20	28.2	1984	1547	2.23
S-15	23.75	9.6	2205	2011	2.53
S-16	25.20	.-.-.	.-.-.	.-.-.	.-.-.
S-17	26.80	8.3	2196	2028	2.54
S-18	28.35	5.4	.-.-.	.-.-.	2.55
S-19	30.05	20.9	1797	1487	2.34

PLATE 6d

SYMBOLS AND TERMS USED ON BORING LOGS

SOIL AND ROCK TYPES
(SHOWN IN SYMBOL COLUMN)



Predominant type shown heavy

SAMPLER TYPES
(SHOWN IN SAMPLES COLUMN)

TERMS DESCRIBING DENSITY CONDITION FOR CONSISTENCY

The condition of coarse grained soils may be obtained by performing sampler penetration tests or cone penetrometer tests. Approximate correlation between these tests and the density condition are given below:

DENSITY CONDITION	SPT VALUES, N	CONE TIP RESISTANCE, MPa
Very loose	< 4	< 2
Loose	4 to 10	2 to 4
Medium dense	10 to 30	4 to 12
Dense	30 to 50	12 to 20
Very dense	> 50	20

Density versus SPT value relationship is after Terzaghi and Peck, 1968. See Lacroix and Horn, 1973 if non-standard samplers are used. Density versus cone tip resistance relationship given above, after Meyerhof 1965; is a function of depth also; see Schmertmann, 1978.

The consistencies of cohesive soils may be obtained by performing undrained shear strength tests. Degrees of consistency are given below:

CONSISTENCY	UNDRAINED SHEAR STRENGTH, kPa
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

TERMS CHARACTERIZING SOIL STRUCTURE

Parting	- horizontal inclusion of different soil type less than 3-mm thick
Seam	- horizontal inclusion of different soil type 3 to 75-mm thick
Layer	- horizontal inclusion of different soil type greater than 75-mm thick
Pocket	- inclusion of different soil type that is smaller than the diameter of the soil sample
Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical
Interbedded	- composed of alternate layers of different soil types
Silty	- containing 12 to 50 percent silt size particles
Calcareous	- containing 12 to 50 percent carbonates
Carbonate	- containing more than 50 percent carbonates

Terms used in this report for describing soils according to their texture or grain size distribution are in accordance with ASTM D 2487-90 and D 2488-90

Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT
TIMOR LESTE

PLATE-7

INTACT ROCK STRENGTH (1)

Term	Unconfined Compressive Strength (MPa)	(ksf)	Field Estimation of Hardness
Extremely strong	>200	>4000	Several blows of geologic hammer required to break specimen.
Very strong	100 - 200	2000 - 4000	More than one blow of geologic hammer required to break specimen.
Strong	50 - 100	1000 - 2000	Hand held specimen can be broken with single blow of hammer.
Moderately strong	12.5 - 50	250 - 1000	Indentation of 5 mm with sharp end of pick.
Moderately weak	5 - 12.5	100 - 250	Too hard to cut by hand into a compression test specimen.
Weak	1.25 - 5	30 - 100	Materials crumbles under firm blows with sharp end of a geologic pick.
Very weak	0.4 - 1.25	10 - 30	Brittle or tough, may be broken by hand with difficulty.

RELATIONSHIP OF RQD AND ROCK QUALITY (2)

Rock Quality	RQD, Rock Quality Designation, (%)
Very poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

RQD is the percentage ratio of the total length of intact core specimens 100 mm or longer to the total length of core run.

WEATHERING

Fresh	- Rock fresh with joints and may show slight staining.
Moderate	- Significant portions of rock show discoloration and weathering effects and show significant loss of strength compared with fresh rock.
Severe	- Rock shows severe loss of strength and can be excavated with geologist's pick.
Very Severe	- Mass effectively reduced to soil with only fragments of strong rock remaining.

DISCONTINUITY SURFACE AND MICROSTRUCTURE SPACING

Description for Bedding planes	Spacing (mm)	Description for Joints Faults or Other Fractures
Very thickly bedded	>1000	Very widely (fractured or jointed)
Thickly bedded	300 - 1000	Widely
Medium bedded	100 - 300	Medium
Thinly bedded	30 - 100	Closely
Very thinly bedded	10 - 30	Very closely
Thickly laminated	3 - 10	-
Thinly laminated	<3	-

JOINT ROUGHNESS CLASSIFICATION (3)

Classification	Description
Smooth	Appears smooth and is smooth to the touch. May be slickensided.
Slightly Rough	Asperities on the fracture surfaces are visible and can be distinctly felt
Medium Rough	Asperities are clearly visible and fracture surface feels abrasive.
Rough	Large angular asperities can be seen some ridge and angle steps are evident.
Very Rough	Near vertical steps and ridges occur on the fracture surface.

References: (1) Geological Society of London Engineering Group, 1977. (2) Deere et al, 1967.
(3) AEG Committee on Core Logging, 1976.

ENGINEERING ROCK MASS CLASSIFICATION TERMS

Geotechnical Investigation
New Tibar Bay Port,
TIMOR LESTE

Plate-8

CLASSIFICATION SYSTEM FOR CARBONATE SOILS AND ROCKS

Additional Descriptive Terms Based on Origin of Constituent Particles

Not Discernible	Bioclastic (Organic)	Oolitic (Inorganic)	Shell (Organic)	Coral (Organic)	Algal (Organic)	Pisolitic (Inorganic)

Increasing Grain Size of Particulate Deposits →

Degree of Induration	< 0.002 mm	0.002 mm – 0.074 mm	0.074 mm – 4.76 mm	4.76 mm – 76 mm	Total Carbonate Content, (constituent particles plus matrix)
(Soil) Non-Indurated	Carbonate Clay	Carbonate Silt (1)	Carbonate Sand (1)	Mixed Carbonate and Non-carbonate Gravel (2)	50%
(Soil) Non-Indurated	Calcareous Clay (3)	Calcareous Silt (1)	Calcareous Sand (1)	Mixed Carbonate and Non-carbonate Gravel (2)	12%
(Soil) Non-Indurated	Clay	Silt	Silica Sand	Gravel	
(Rock) Moderately Indurated	Limestone	Limestone	Limestone	Limestone Conglomerate or Breccia	88%
(Rock) Moderately Indurated	Clayey Limestone	Fine-grained Limestone	Sandy Limestone	Limestone Conglomerate or Breccia	50%
(Rock) Moderately Indurated	Calcareous Claystone	Calcareous Siltstone	Calcareous Sandstone	Calcareous Conglomerate or Breccia	12%
(Rock) Moderately Indurated	Claystone	Siltstone	Sandstone	Conglomerate or Breccia	

Terms Related to Carbonate Classification

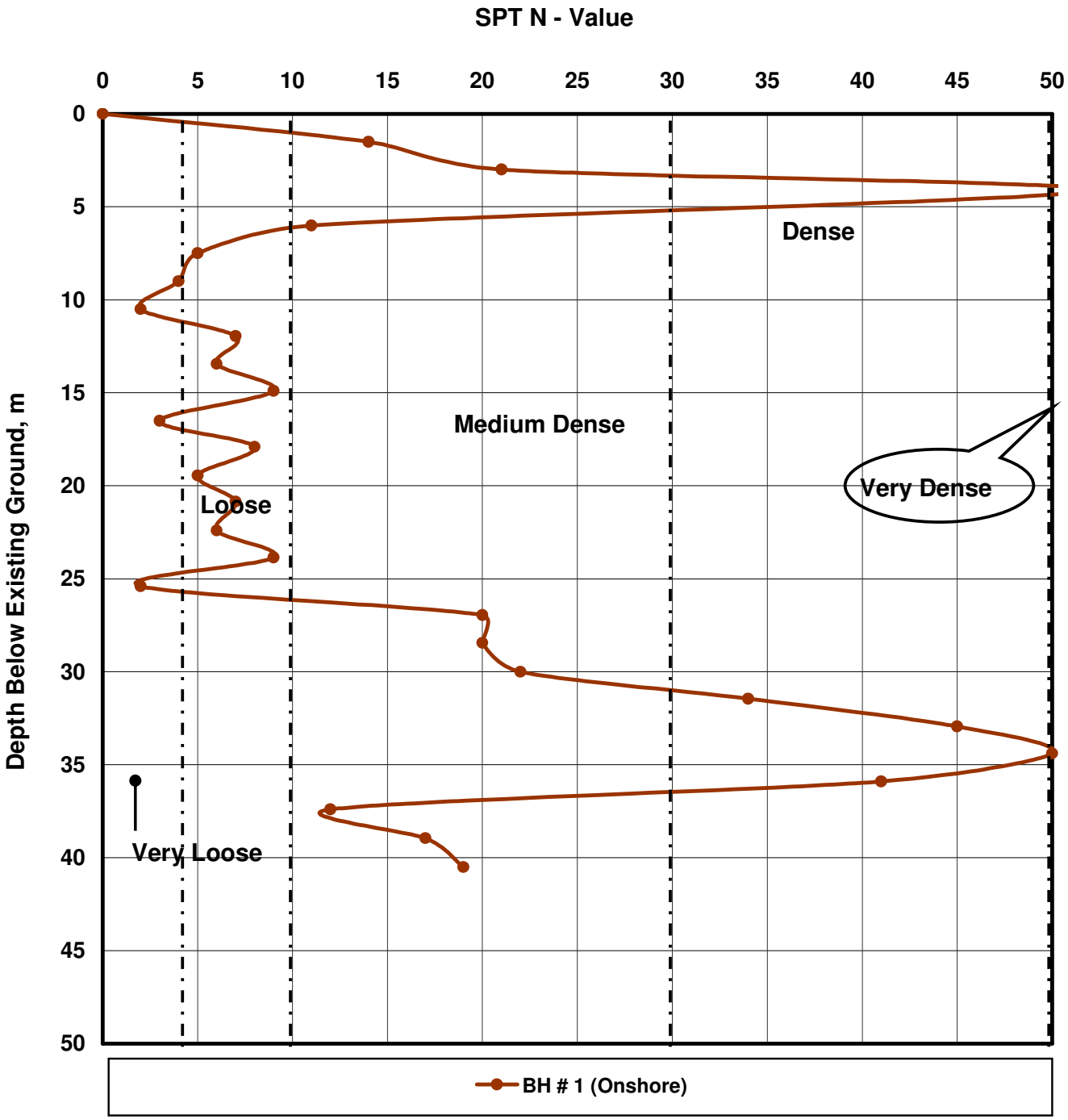
- Algal - Composed of the remains of calcareous secreting algae
- Authigenic - Formed in place by chemical or biochemical action
- Bioclastic - Consisting of fragmental remains of organisms
- Coral - Calcareous skeleton of a coral or group of corals
- Detrital - Derived of pre-existing rock fragments
- Oolitic - Made up of ooliths (0.25 to 2 mm round particles, usually carbonate)
- Pisolitic - Made up of pisoliths (2 to 10 mm round particles, usually carbonate)
- Shell - The generally hard rigid covering of an animal, commonly calcareous
- Siliceous - Containing abundant quartz or silica, generally cryptocrystalline

Notes:

1) Non-carbonate constituents are likely to be siliceous apart from local concentration of minerals such as feldspar and mixed heavy minerals

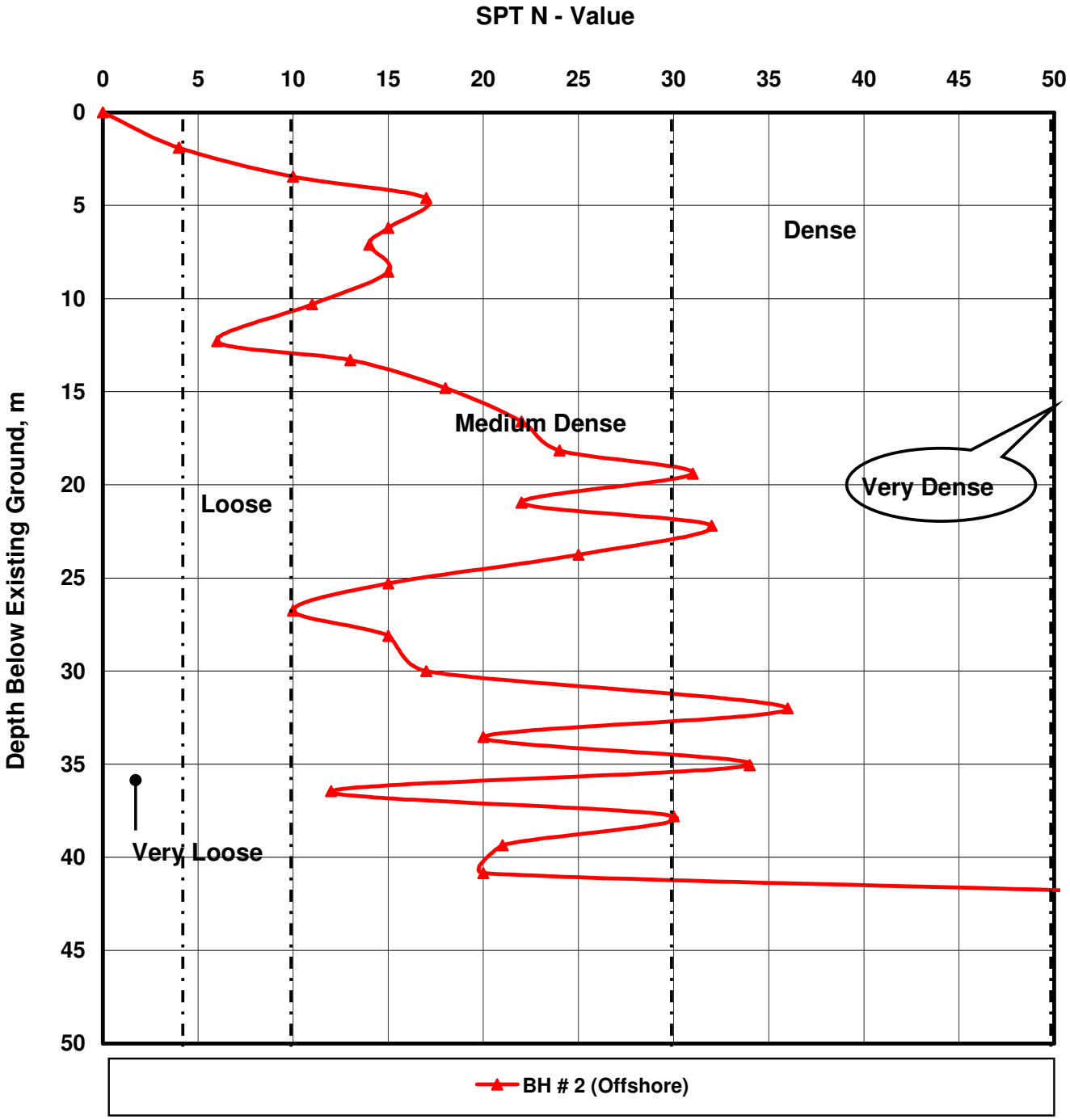
2) In description, the rough proportions of carbonate and non-carbonate constituents should be quoted and details of both the particle minerals and matrix minerals should be included

3) Calcareous is suggested as a general term to indicate the presence of unidentified carbonate. When mineral identification is possible calcareous referring to calcite or alternative adjectives such as dolomitic, aragonitic, sideritic, etc. should be used



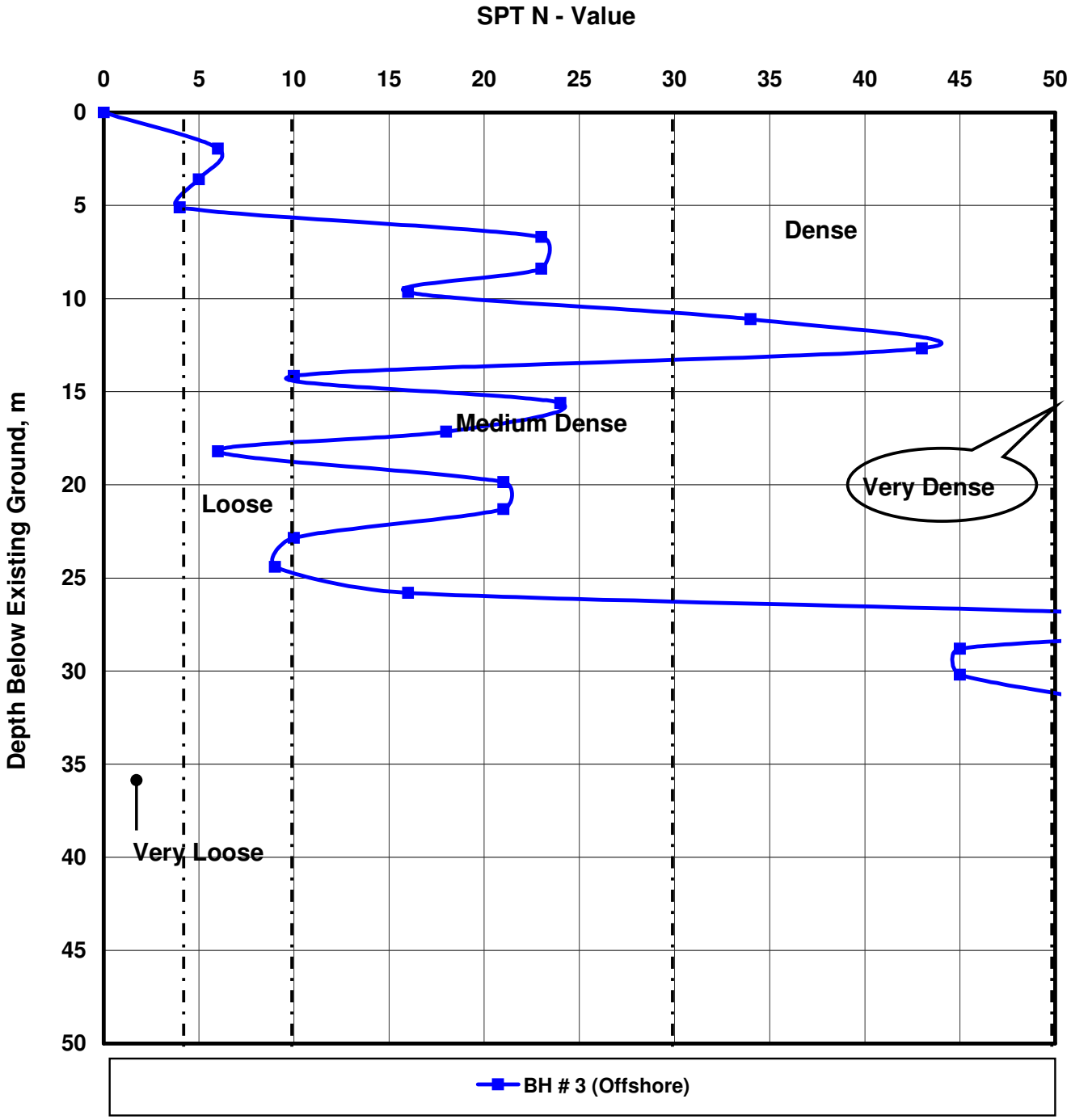
SPT N-Value Vs Depth PLOT
Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT,
DILI, TIMOR LESTE

PLATE – 10a



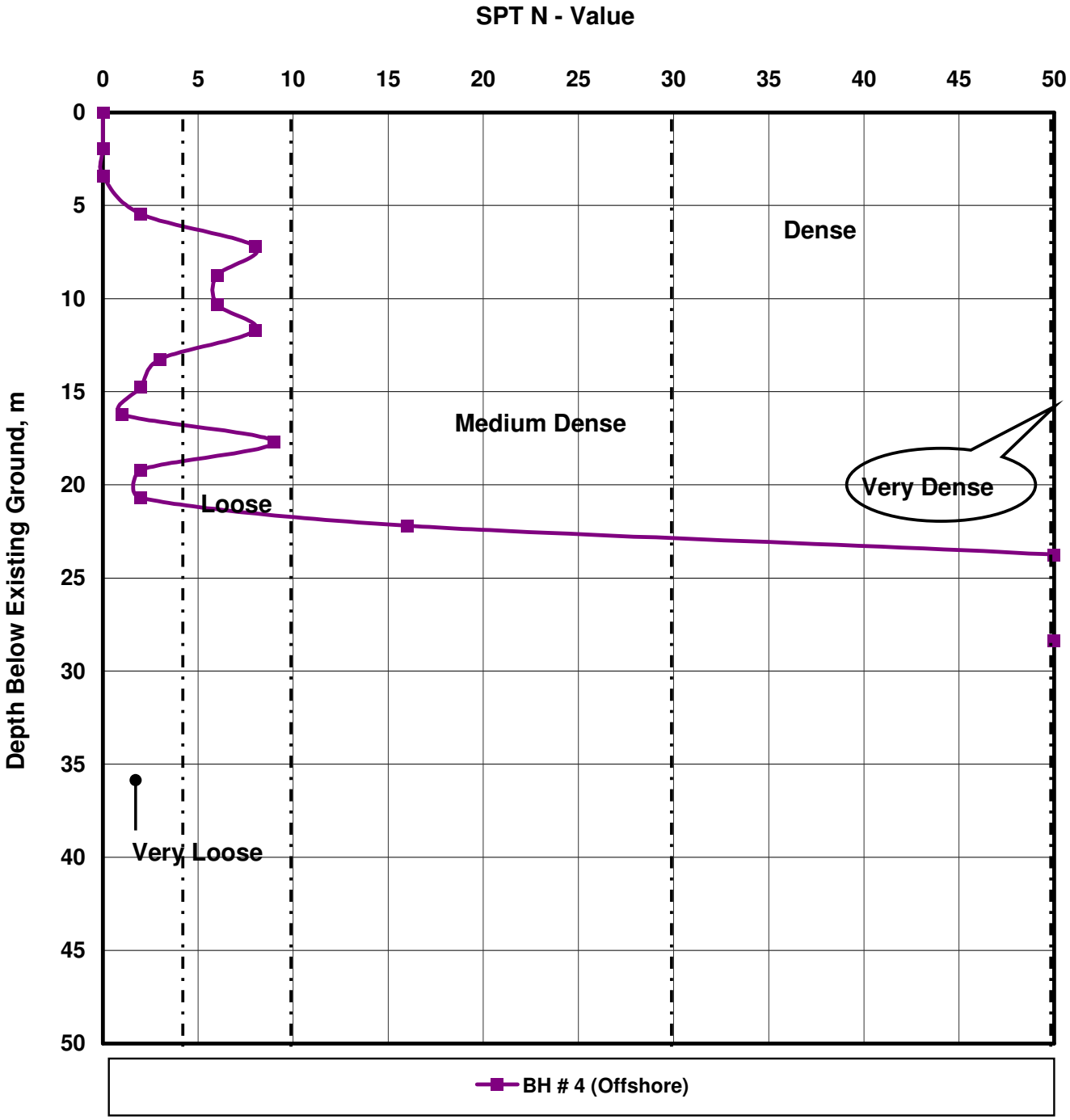
SPT N-Value Vs Depth PLOT
Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT,
DILI, TIMOR LESTE

PLATE – 10b



SPT N-Value Vs Depth PLOT
Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT,
DILI, TIMOR LESTE

PLATE – 10c

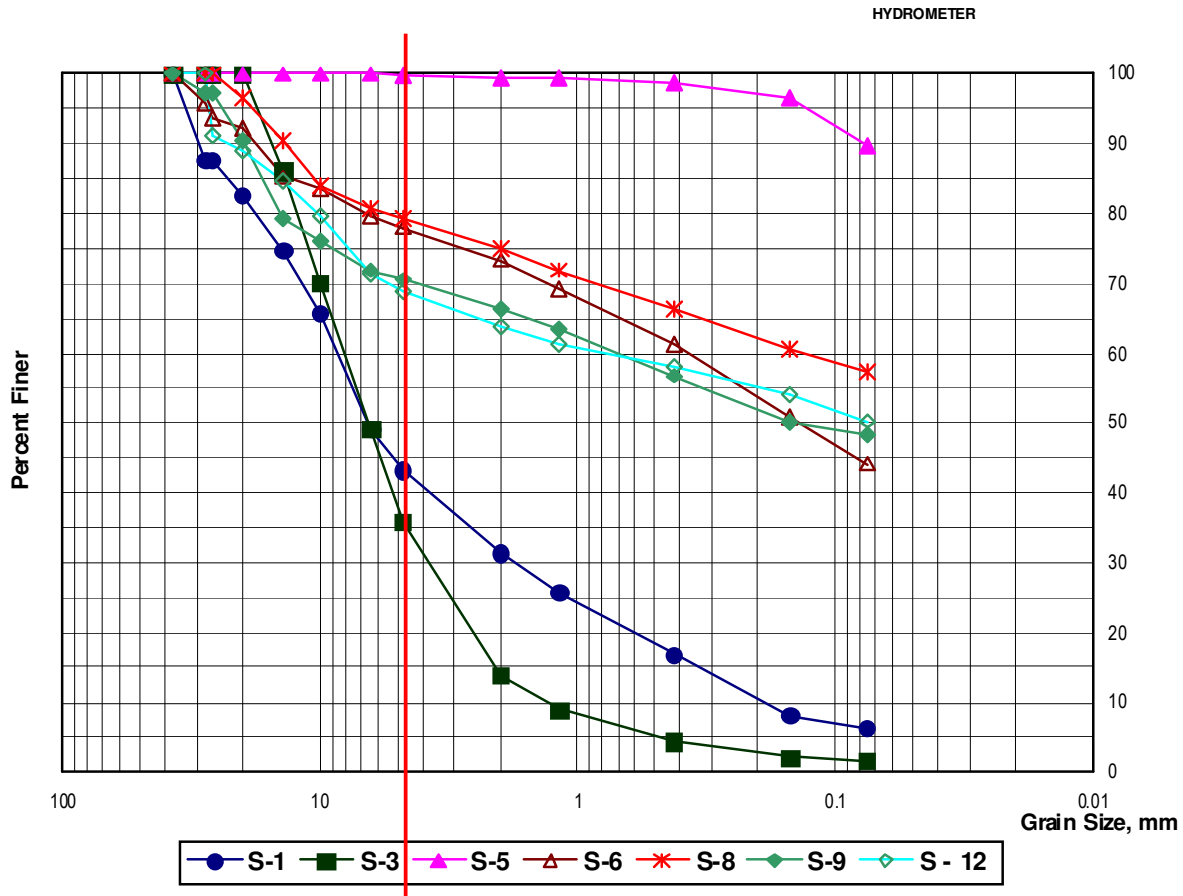


SPT N-Value Vs Depth PLOT
Geotechnical Investigation
URGENT SHIFT OF FERRY TERMINAL IN DILI PORT,
DILI, TIMOR LESTE

PLATE – 10d

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 1	1.50	S – 1	Sandy well graded GRAVEL with Silt (GW-GM)	6.2
■	BH # 1	4.15	S – 3	Sandy well graded GRAVEL (GW)	1.5
▲	BH # 1	7.50	S – 5	SILT with little Sand (ML)	89.7
△	BH # 1	9.00	S – 6	Silty, Gravelly fine to coarse SAND (SM)	44.2
→←	BH # 1	11.95	S – 8	SILT with Sand & Gravel (ML)	57.3
◆	BH # 1	13.45	S – 9	Silty well graded GRAVEL with Sand (GM)	48.2
◇	BH # 1	17.90	S – 12	Gravelly SILT with Sand (ML)	50.2

GRAIN SIZE CURVES

Geotechnical Investigation

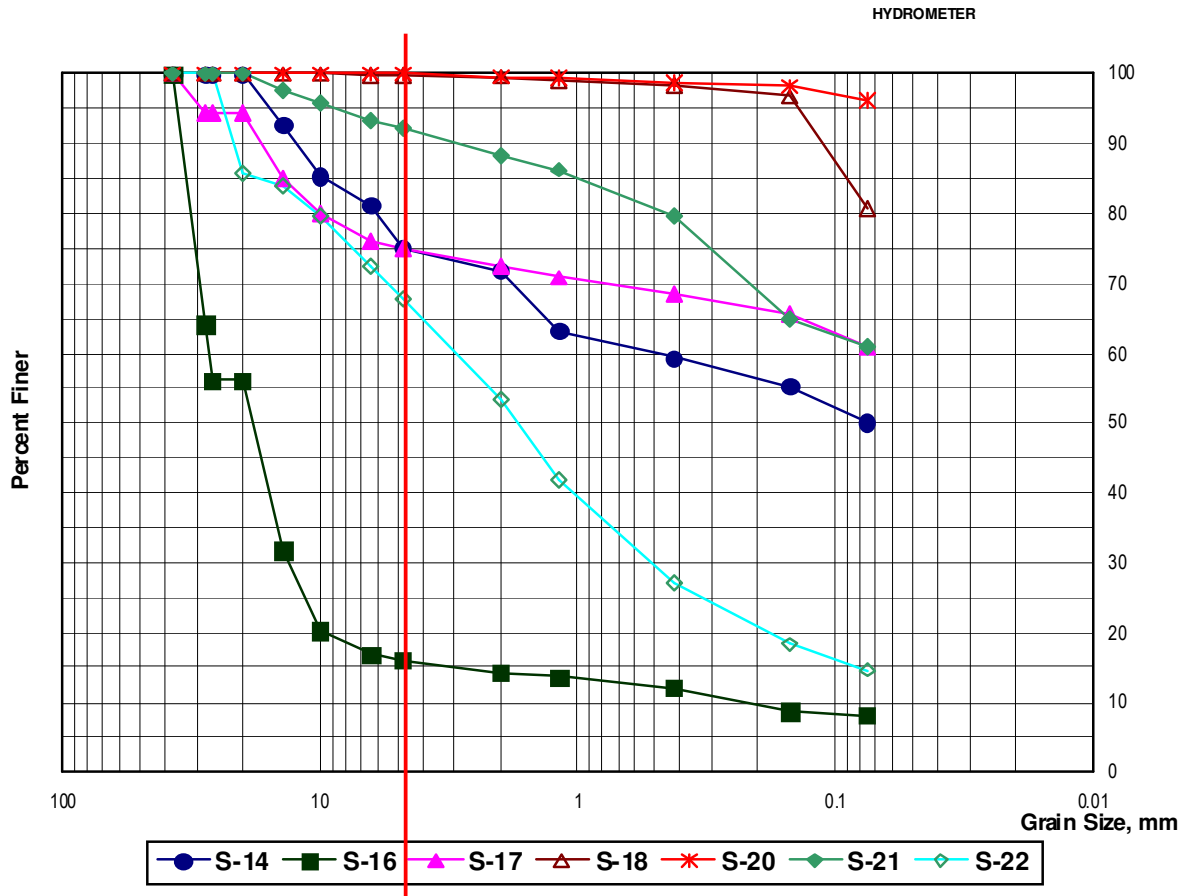
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 11

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 1	20.85	S – 14	SILT with Sand & Gravel (ML)	50.0
■	BH # 1	23.85	S – 16	Well graded GRAVEL with Silt (GW-GM)	8.0
▲	BH # 1	25.40	S – 17	SILT with Sand & Gravel (ML)	60.8
△	BH # 1	26.95	S – 18	SILT with fine Sand (ML)	80.7
→←	BH # 1	30.00	S – 20	SILT (ML)	96.2
◆	BH # 1	31.45	S – 21	Sandy SILT (ML)	61.0
◇	BH # 1	32.95	S – 22	Silty, Gravelly fine to coarse SAND (SM)	14.6

GRAIN SIZE CURVES

Geotechnical Investigation

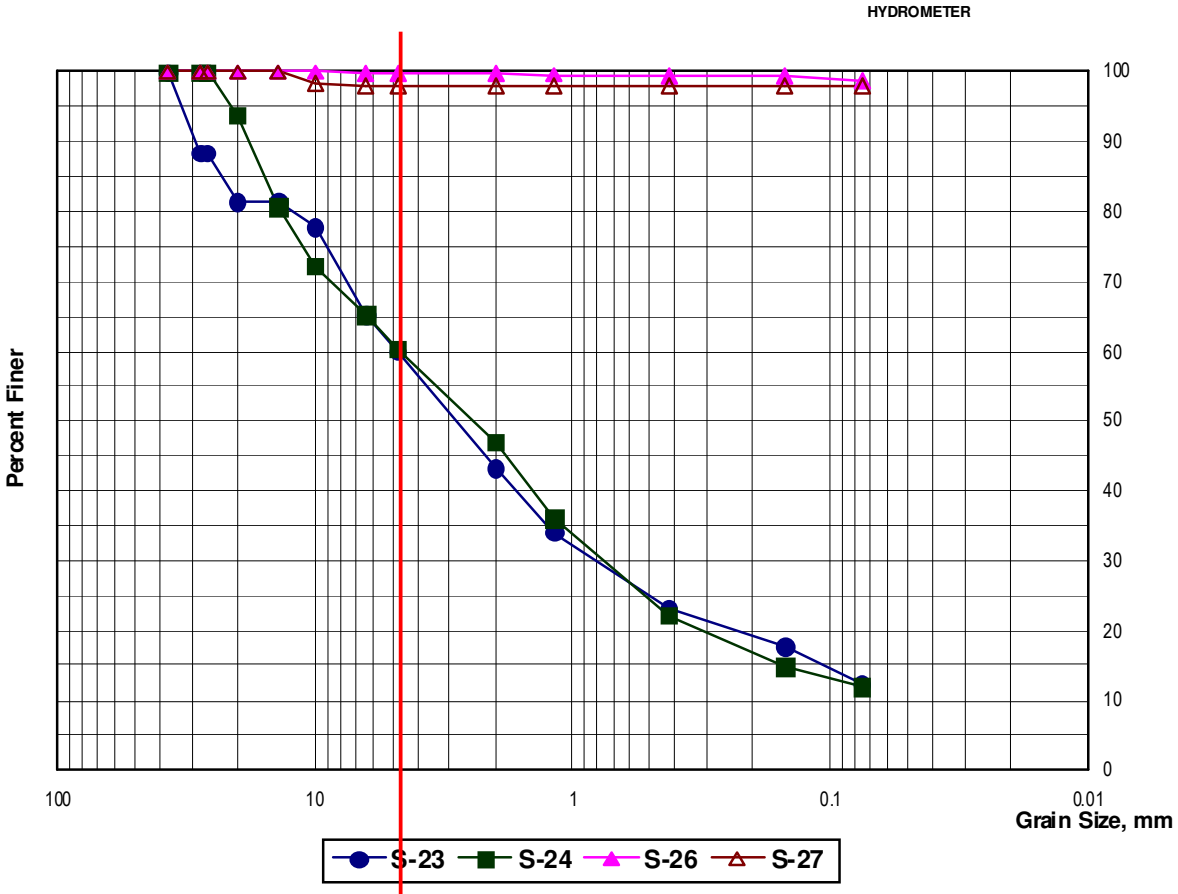
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 12

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 1	34.40	S – 23	Silty, Gravelly fine to coarse SAND (SM)	12.3
■	BH # 1	35.90	S – 24	Gravelly fine to coarse SAND with Gravel (SM)	11.9
▲	BH # 1	38.95	S – 26	SILT (ML)	98.7
△	BH # 1	40.50	S – 27	SILT (ML)	97.9

GRAIN SIZE CURVES

Geotechnical Investigation

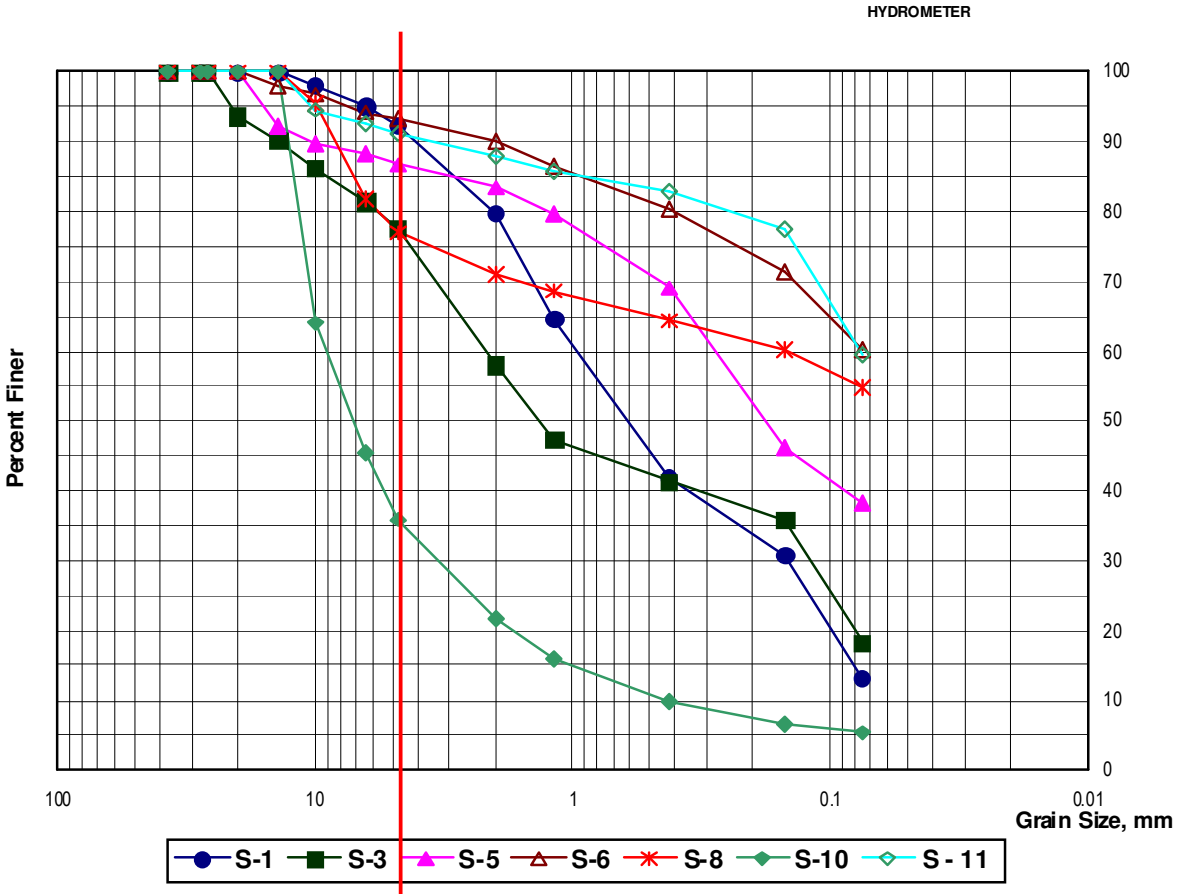
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 13

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 2	1.90	S – 1	Silty fine to coarse SAND with little Gravel (SM)	13.2
■	BH # 2	4.60	S – 3	Silty fine to coarse SAND with Gravel (SM)	18.3
▲	BH # 2	7.10	S – 5	Silty fine to coarse SAND with Gravel (SM)	38.2
△	BH # 2	8.55	S – 6	SILT with Sand & little Gravel (ML)	60.1
→←	BH # 2	12.30	S – 8	SILT with Sand & Gravel (ML)	54.9
◆	BH # 2	13.30	S – 9	Sandy well graded GRAVEL with Silt (GW-GM)	5.3
◇	BH # 2	18.15	S – 12	SILT with Sand & little Gravel (ML)	59.6

GRAIN SIZE CURVES

Geotechnical Investigation

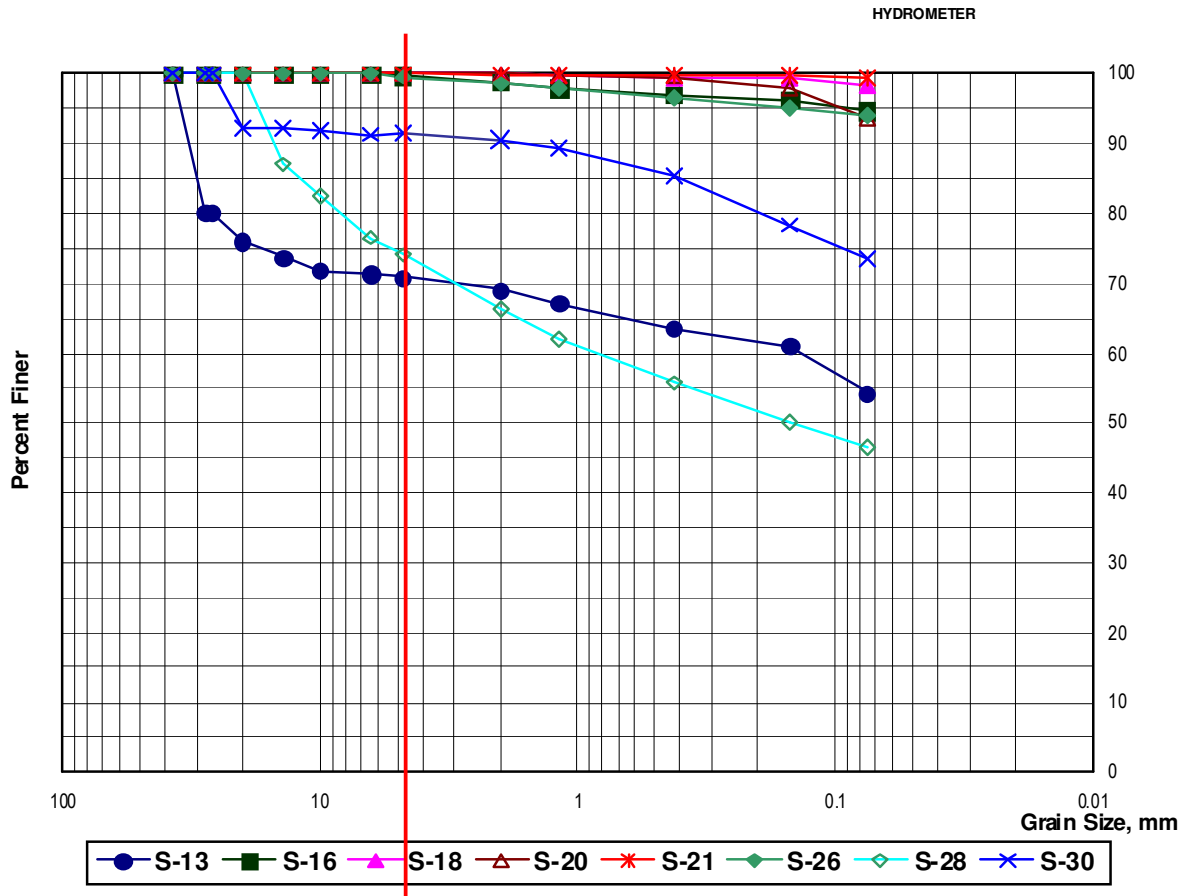
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 14

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 2	19.40	S – 13	Gravelly SILT with Sand (ML)	54.3
■	BH # 2	23.75	S – 16	SILT (ML)	94.7
▲	BH # 2	26.75	S – 18	SILT (ML)	98.3
△	BH # 2	30.00	S – 20	SILT (ML)	93.7
→←	BH # 2	32.00	S – 21	SILT (ML)	99.5
◆	BH # 2	39.35	S – 26	SILT (ML)	93.9
◇	BH # 2	42.30	S – 28	Silty, Gravelly fine to coarse SAND (SM)	46.6
	BH # 2	45.05	S – 30	SILT with Sand & little Gravel (ML)	73.4

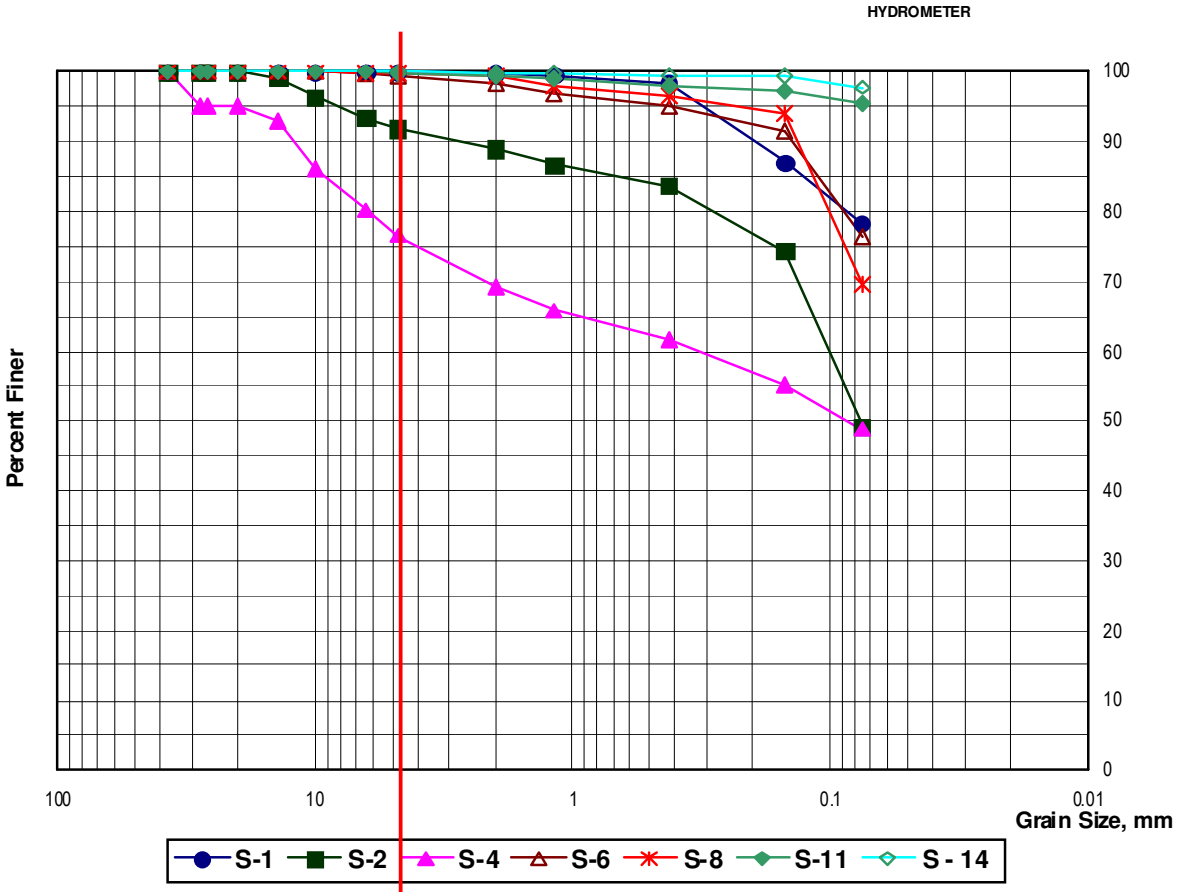
GRAIN SIZE CURVES

Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

PLATE - 15

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 3	1.95	S – 1	SILT with fine Sand (ML)	78.2
■	BH # 3	3.60	S – 2	Silty fine to medium SAND with little Gravel (SM)	49.2
▲	BH # 3	6.70	S – 4	Silty fine to coarse SAND with Gravel (SM)	48.8
△	BH # 3	9.65	S – 6	SILT with fine Sand (ML)	76.3
→←	BH # 3	12.67	S – 8	Fine Sandy SILT (ML)	69.6
◆	BH # 3	17.15	S – 11	SILT (ML)	95.3
◇	BH # 3	21.30	S – 14	SILT (ML)	97.8

GRAIN SIZE CURVES

Geotechnical Investigation

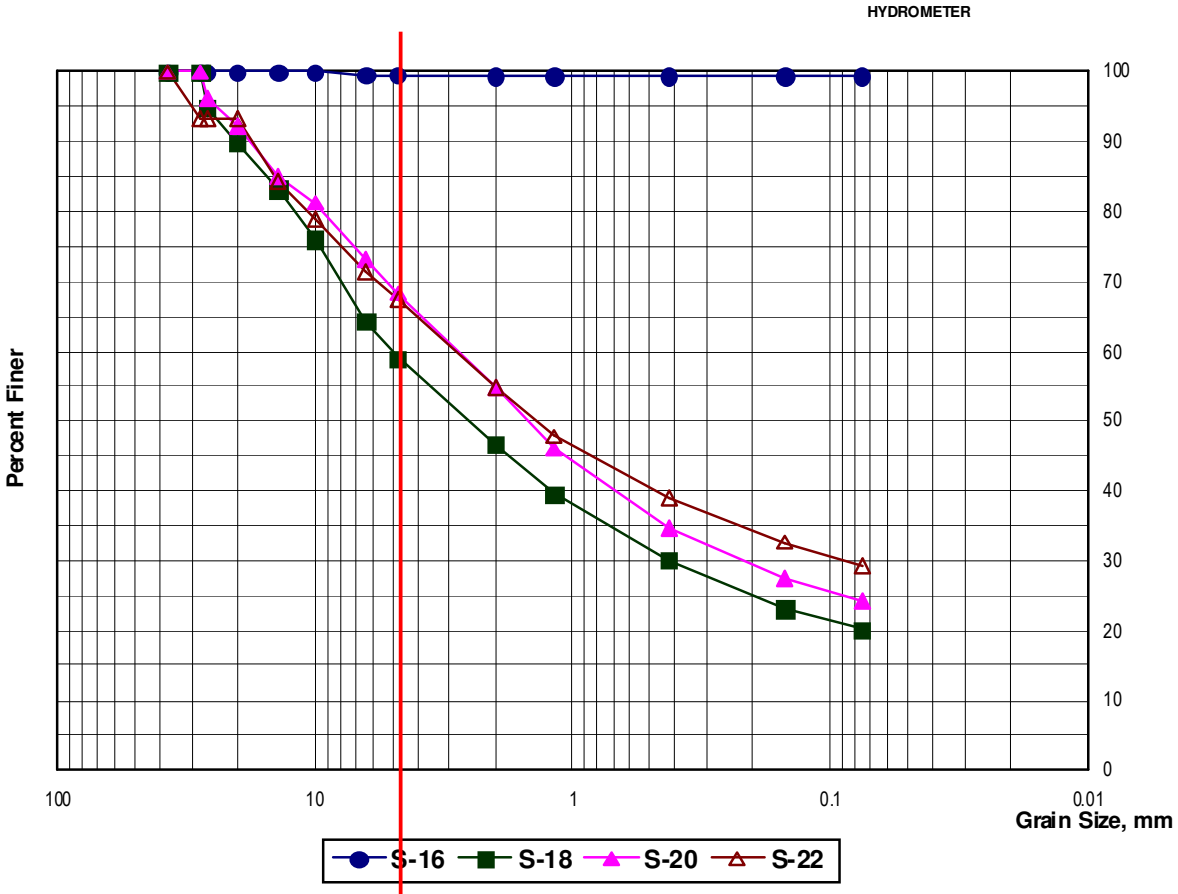
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 16

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 3	24.40	S – 16	SILT (ML)	99.3
■	BH # 3	27.30	S – 18	Silty, Gravelly fine to coarse SAND (SM)	20.1
▲	BH # 3	30.20	S – 20	Silty, Gravelly fine to coarse SAND (SM)	24.1
△	BH # 3	33.60	S – 22	Silty, Gravelly fine to coarse SAND (SM)	29.2

GRAIN SIZE CURVES

Geotechnical Investigation

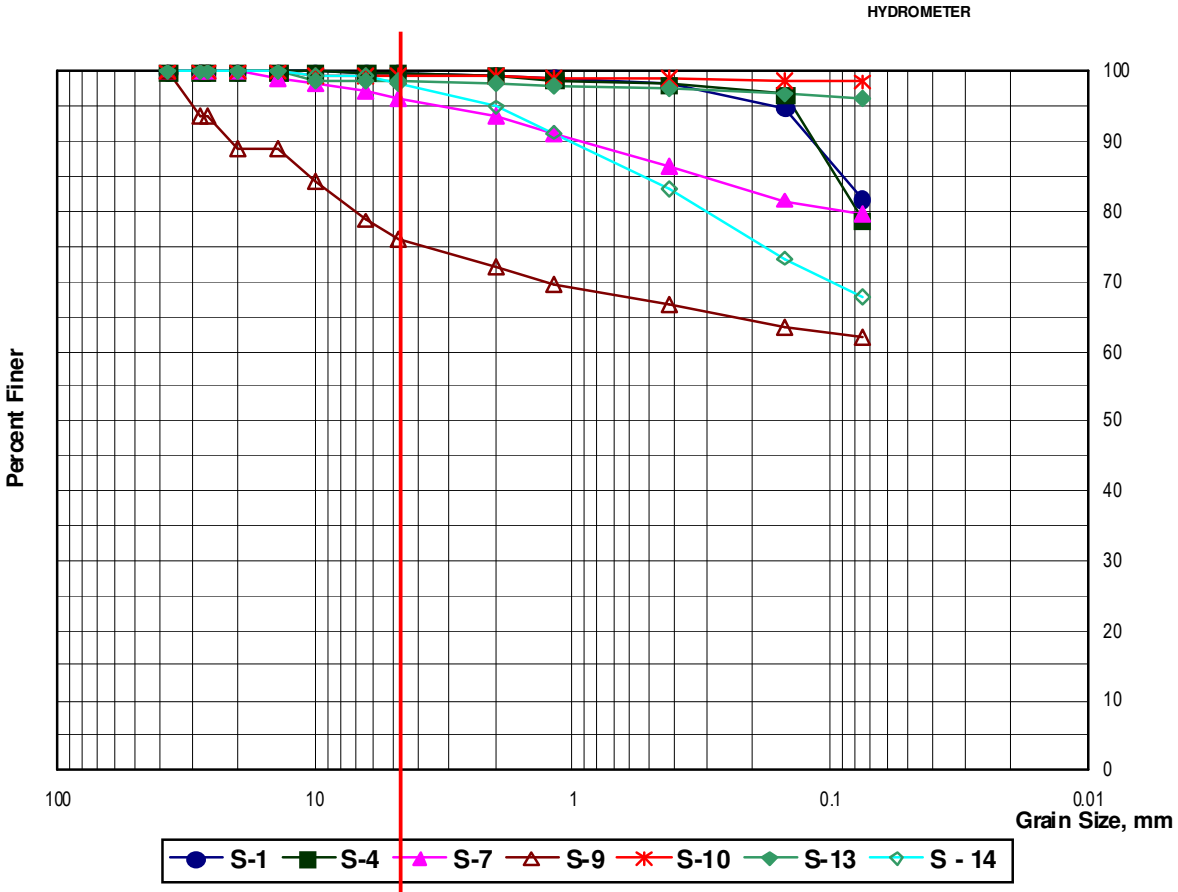
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 17

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 4	1.95	S – 1	SILT with Sand (ML)	81.7
■	BH # 4	7.20	S – 4	SILT with Sand (ML)	78.7
▲	BH # 4	10.30	S – 7	SILT with Sand (ML)	79.6
△	BH # 4	13.25	S – 9	SILT with Sand & Gravel (ML)	61.9
→←	BH # 4	14.75	S – 10	SILT (ML)	98.6
◆	BH # 4	19.20	S – 13	SILT (ML)	96.2
◇	BH # 4	20.70	S – 14	Sandy SILT (ML)	67.9

GRAIN SIZE CURVES

Geotechnical Investigation

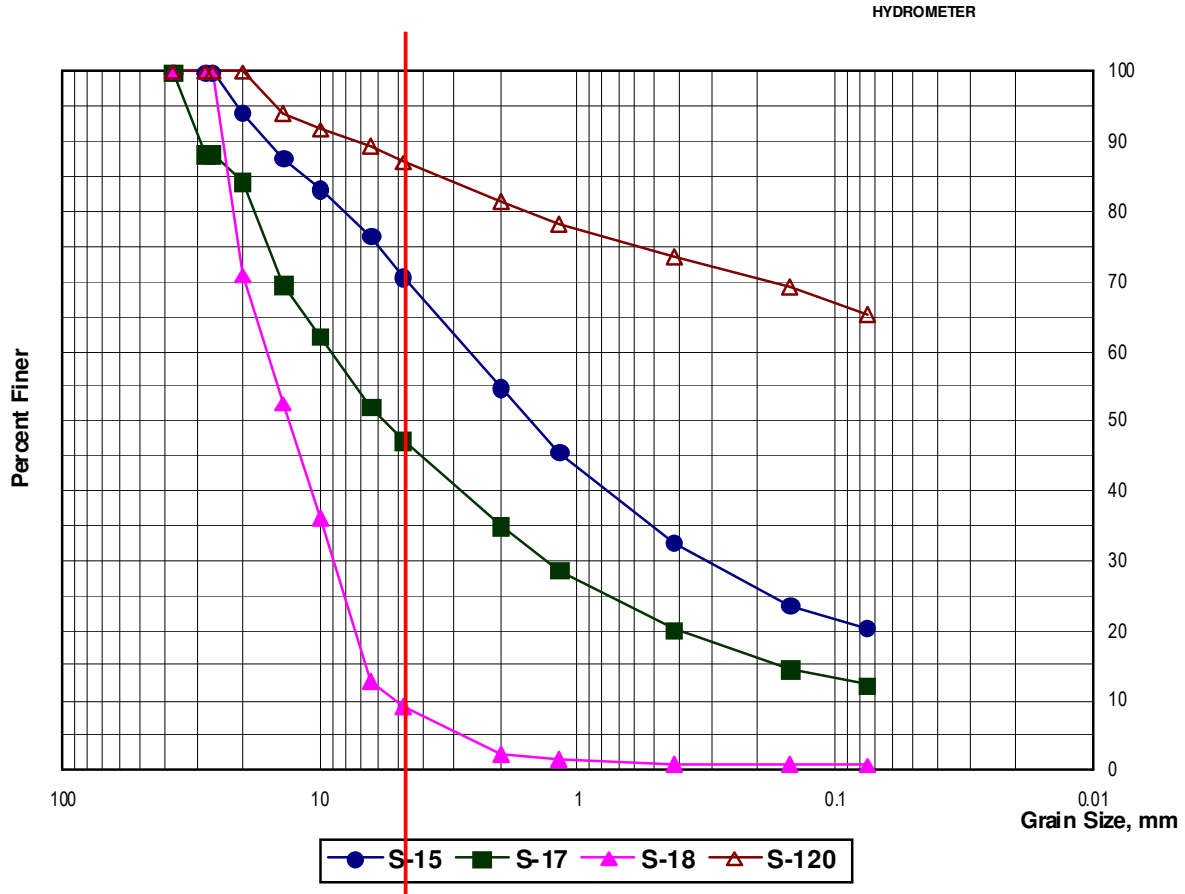
Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

PLATE - 18

GRAIN SIZE ANALYSIS

Report No. GET 15-8035



GRAVEL / KANKAR		SAND			SILT / CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Specimen Identification		Depth m	Sample Nos.	Classification	-0.075
●	BH # 4	22.20	S – 15	Silty, Gravelly fine to coarse SAND (SM)	20.3
■	BH # 4	25.20	S – 17	Silty, Sandy well graded GRAVEL (GM)	12.2
▲	BH # 4	26.80	S – 18	Well graded GRAVEL with little Sand (GW)	0.6
△	BH # 4	30.05	S – 20	SILT with Sand & Gravel (ML)	65.3

GRAIN SIZE CURVES

Geotechnical Investigation

Urgent Shift of Ferry Terminal In Dili Port

Timor Leste

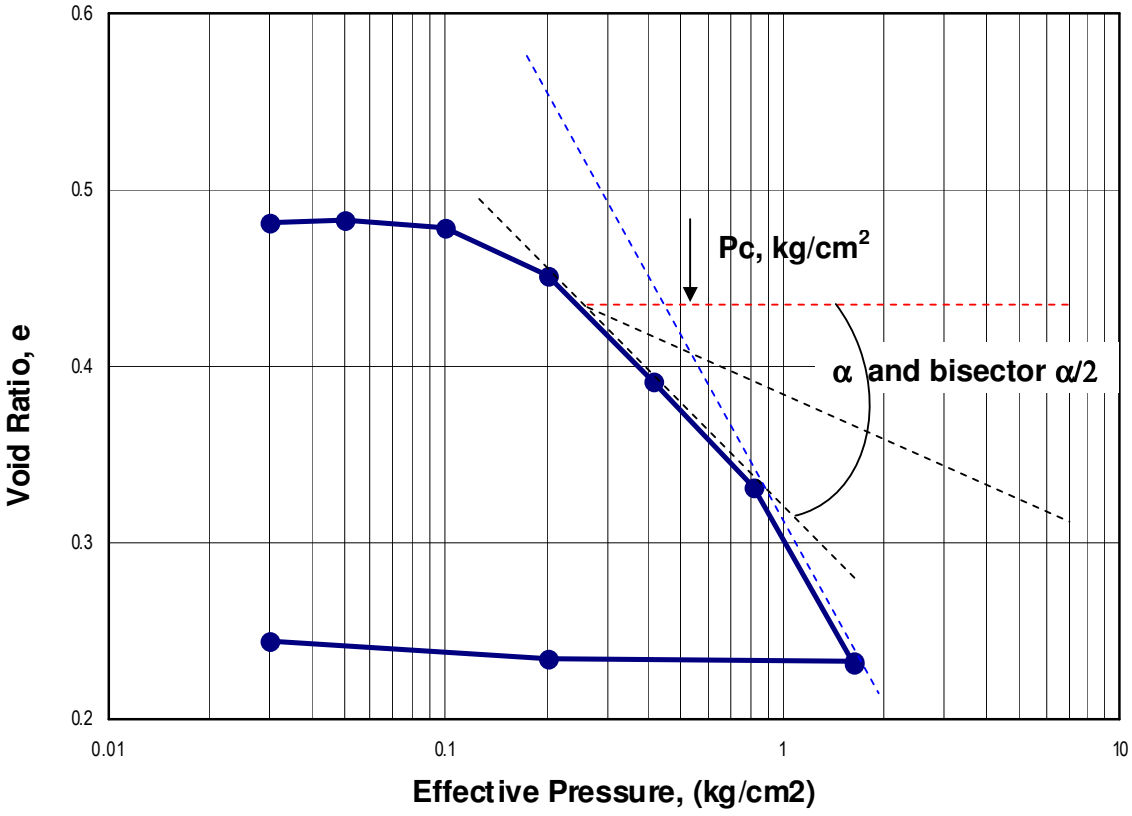
PLATE - 19

Geotechnik Ltd

e – log P' ANALYSIS

Report No. GET15-8035

Material: **Very loose whitish grey carbonate SILT with Sand & Gravel (ML), with low plasticity**
Depth : **10.05 to 10.50 m**
Borehole: **BH # 1 S-7 Remoulded**
Percentage of Fines (-0.075mm): **57.3 %**
Liquid Limit: **36.7 %**
Plastic Limit: **27.36 %**
Plastic Index: **9.34 %**
Natural Moisture Content: **39.6 %**
Maximum Pre-consolidation Pressure (Pc): **0.53 kg/cm^2**



Void Ratio Verses Effective Pressure Curve

Geotechnical Investigation

Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

Plate 20 Consolidation Curve

Material: **Very loose whitish grey carbonate SILT with Sand & Gravel (ML), with low plasticity**
Depth : **10.05 to 10.50 m** Borehole: **BH # 1, S-7, Remoulded**

Loading Data:

Applied Pressure (kg/cm^2)	δH (mm)	Specimen Height (mm)	Void Ratio (e)	t_{90} (minutes)	Cc	a_v (cm^2/kg)	m_v (cm^2/kg)	C_v (cm^2/kg)	K = $C_v\, m_v\, \gamma_w$ (cm/min.)
0.00 - 0.03	0.080	13.020	0.4813	-	-	-	-		
0.03 - 0.05	0.060	13.040	0.4834	60	-0.010	-0.109	-0.070	5.361	0.000373
0.05 – 0.1	0.100	13.000	0.4791	90	0.008	0.087	0.056	3.441	0.000191
0.1 – 0.2	0.350	12.750	0.4518	120	0.033	0.273	0.174	2.000	0.000348
0.2 – 0.41	0.900	12.200	0.3917	150	0.053	0.286	0.182	0.787	0.000143
0.41 – 0.82	1.450	11.650	0.3317	180	0.042	0.146	0.093	0.054	0.000005
0.82 - 1.63	2.370	10.730	0.2312	720	0.058	0.124	0.079	0.003	0.000000

Un-loading Data:

Un-loading (kg/cm^2)	Void Ratio (e)
0.82	0.233
0.20	0.235
0.03	0.244

Legend:

C_c ; Compression Index.
a_v : Coefficient of Compression.
m_v : Coefficient of Volume Compressibility.
C_v : Coefficient of Consolidation.
Pc : 0.53 Preconsolidation Pressure, **kg/cm^2**.
K : Coefficient of Permeability.

CONSOLIDATION TEST RESULT DATA

Geotechnical Investigation

Urgent Shift of Ferry Terminal In Dili Port, Timor Leste

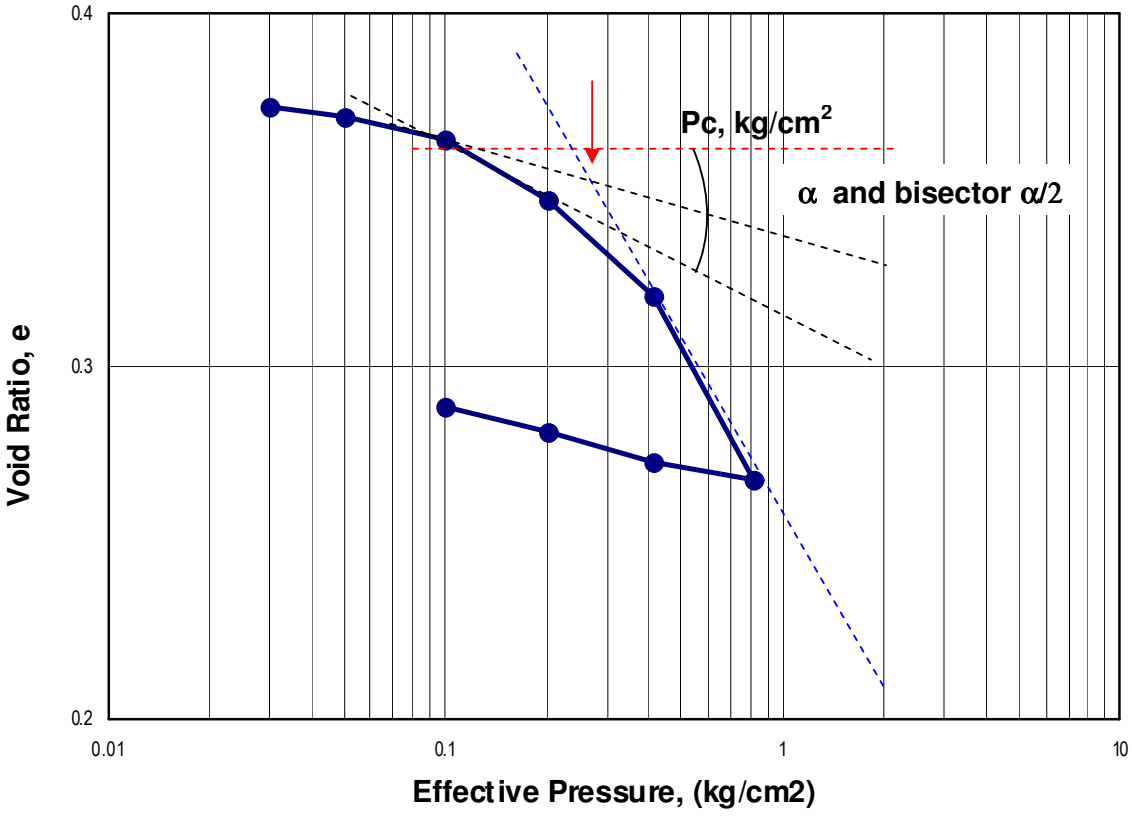
Plate 21 Consolidation Data

Geotechnik Ltd

e – log P' ANALYSIS

Report No. GET15-8035

Material: **Medium dense dark grey carbonate SILT with Sand & little Gravel (ML), with low plasticity**
Depth : **8.10 to 8.550 m**
Borehole: **BH # 2, S-6, Remoulded**
Percentage of Fines (-0.075mm): **60.1 %**
Liquid Limit: **47.67 %**
Plastic Limit: **33.95 %**
Plastic Index: **13.72 %**
Natural Moisture Content: **32.2 %**
Maximum Pre-consolidation Pressure (Pc): **0.28 kg/cm^2**



Void Ratio Verses Effective Pressure Curve

Geotechnical Investigation

Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

Plate 22 Consolidation Curve

Geotechnik Ltd

e – log P' ANALYSIS

Report No. GET15-8035

Material: **Medium dense dark grey carbonate SILT with Sand & little Gravel (ML), with low plasticity**
Depth : **8.10 to 8.55 m** Borehole: **BH # 2, S-6 Remoulded**

Loading Data:

Applied Pressure (kg/cm^2)	δH (mm)	Specimen Height (mm)	Void Ratio (e)	t_{90} (minutes)	Cc	a_v (cm^2/kg)	m_v (cm^2/kg)	C_v (cm^2/min)	K = $C_v\, m_v\, \gamma_w$ (cm/min.)
0.00 - 0.03	0.01	13.99	0.3739	-	-	-	-		
0.03 - 0.05	0.04	13.96	0.3710	60	0.431	0.147	0.107	0.738	7.9104E-05
0.05 – 0.1	0.11	13.89	0.3641	90	0.431	0.137	0.100	0.731	7.3092E-05
0.1 – 0.2	0.28	13.72	0.3474	120	0.431	0.167	0.121	0.713	8.6595E-05
0.2 – 0.41	0.56	13.44	0.3199	150	0.431	0.131	0.095	0.684	6.5174E-05
0.41 – 0.82	1.09	12.91	0.2678	180	0.431	0.127	0.092	0.631	5.8301E-05

Un-loading Data:

Un-loading (kg/cm^2)	Void Ratio (e)
0.41	0.2728
0.20	0.2816
0.03	0.2885
0.00	0.3130

Legend:

C_c ; Compression Index.
a_v : Coefficient of Compression.
m_v : Coefficient of Volume Compressibility.
C_v : Coefficient of Consolidation.
Pc : 0.28 Preconsolidation Pressure, **kg/cm^2**.
K : Coefficient of Permeability.

CONSOLIDATION TEST RESULT DATA

Geotechnical Investigation

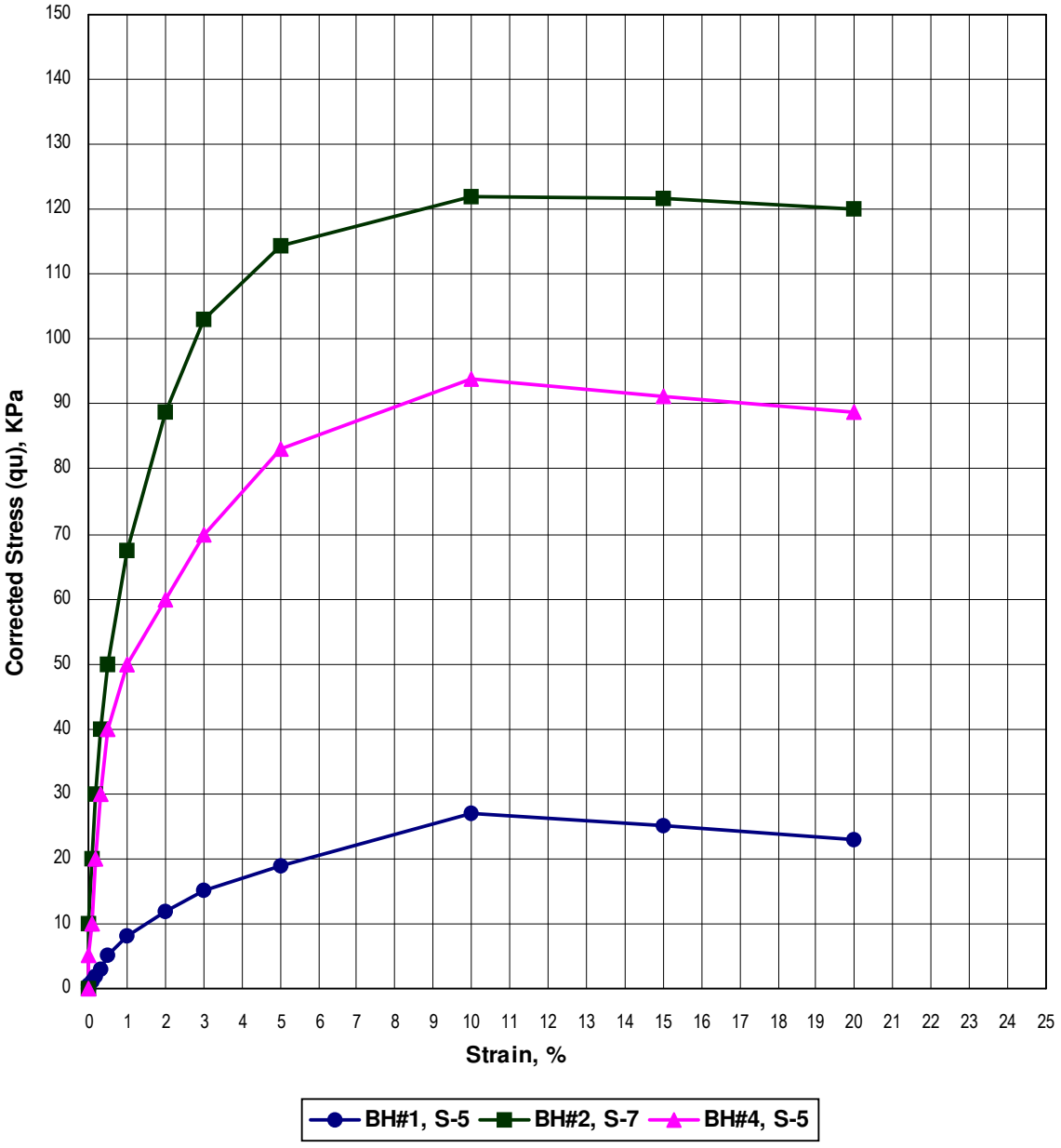
Urgent Shift of Ferry Terminal In Dili Port, Timor Leste

Plate 23 Consolidation Data

Geotechnik Ltd

UU Test Results ASTM D-2850

Report No. GET 15-8035



Specimen Identification		Depth m	Sample Nos.	Unconfined Compressive Strength (qu) KPa	Undrained Shear Strength (Su) KPa
●	BH # 1	7.05-7.50	S – 5	27	13.5
■	BH # 2	9.85-10.30	S – 7	122	61
▲	BH # 4	6.75-7.20	S – 4	94	47

Unconsolidated Undrained Tri-axial Compression Test Results

Geotechnical Investigation

Urgent Shift of Ferry Terminal In Dili Port

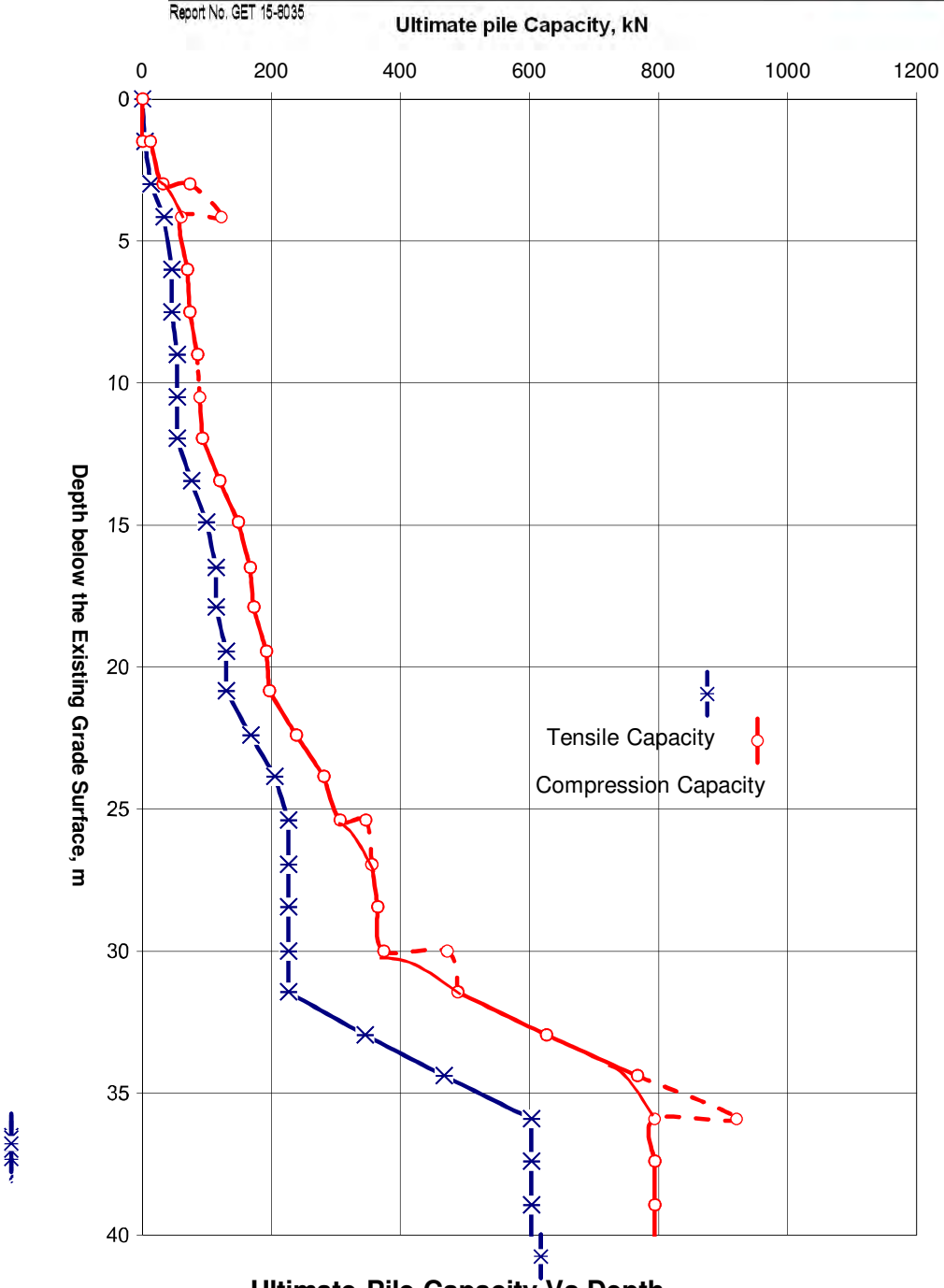
Timor Leste

PLATE - UUT

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



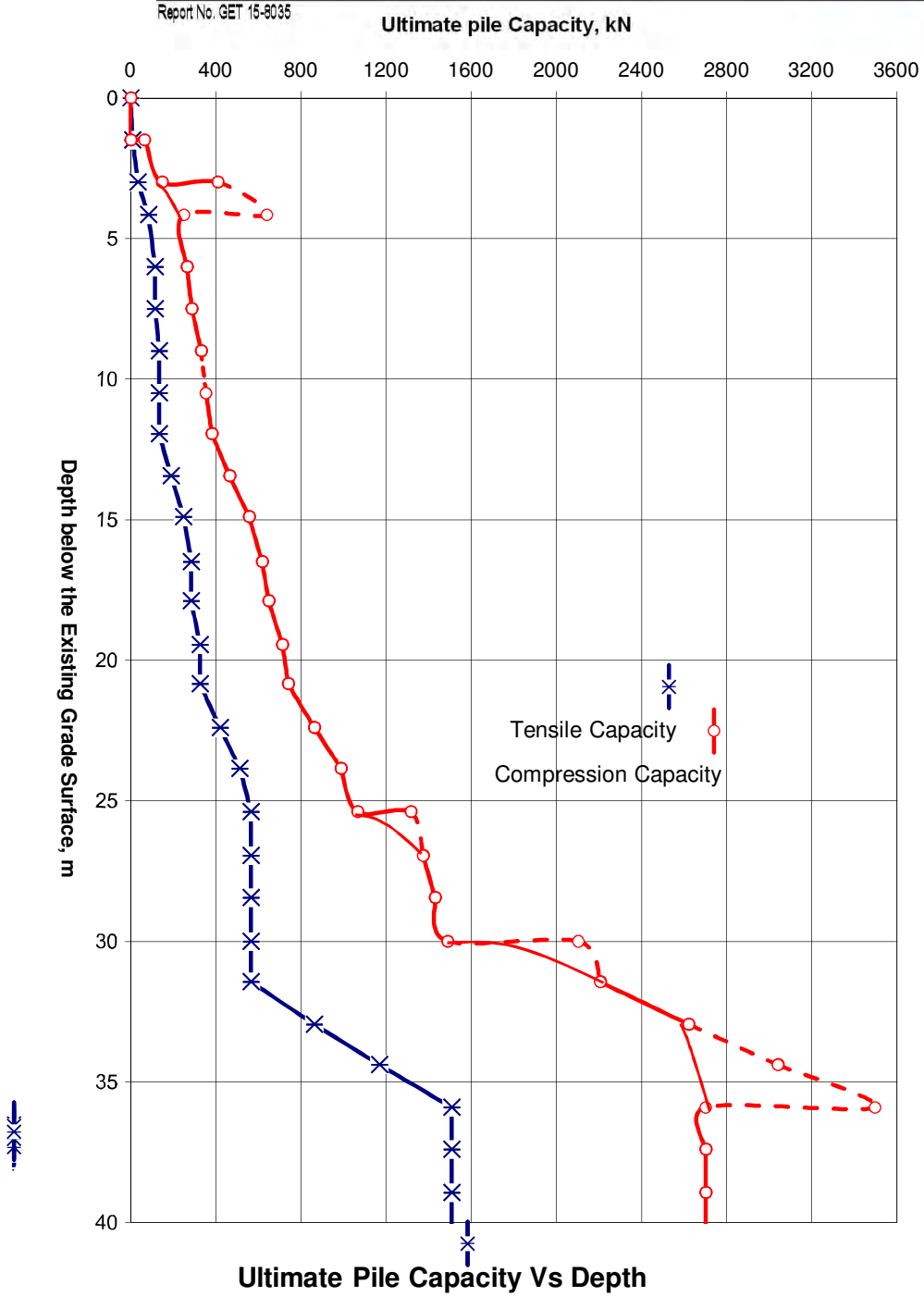
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
On-SHORE) TIMOR LESTE)

PLATE- 24a

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



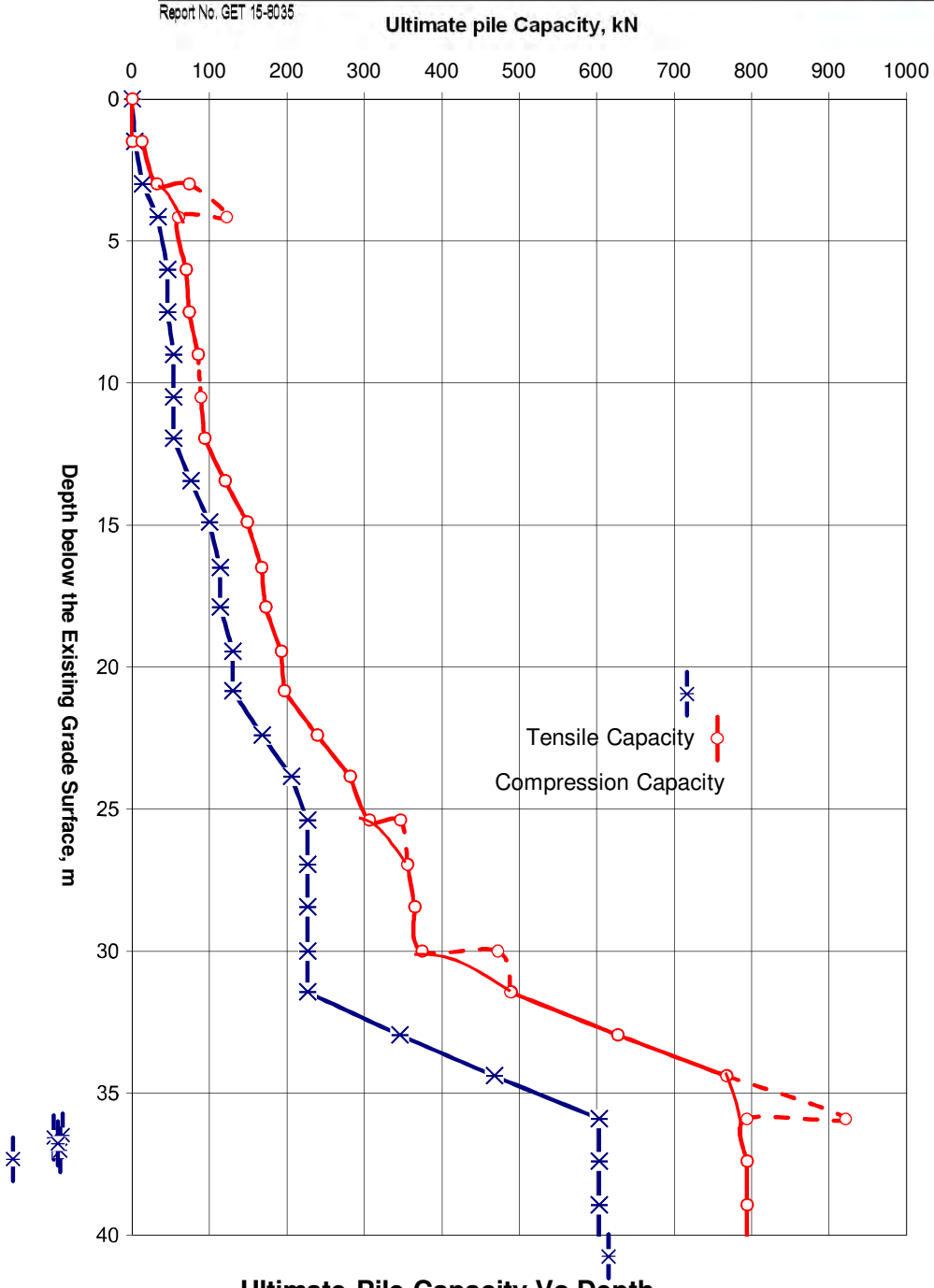
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
On-SHORE) TIMOR LESTE)

PLATE- 24b

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



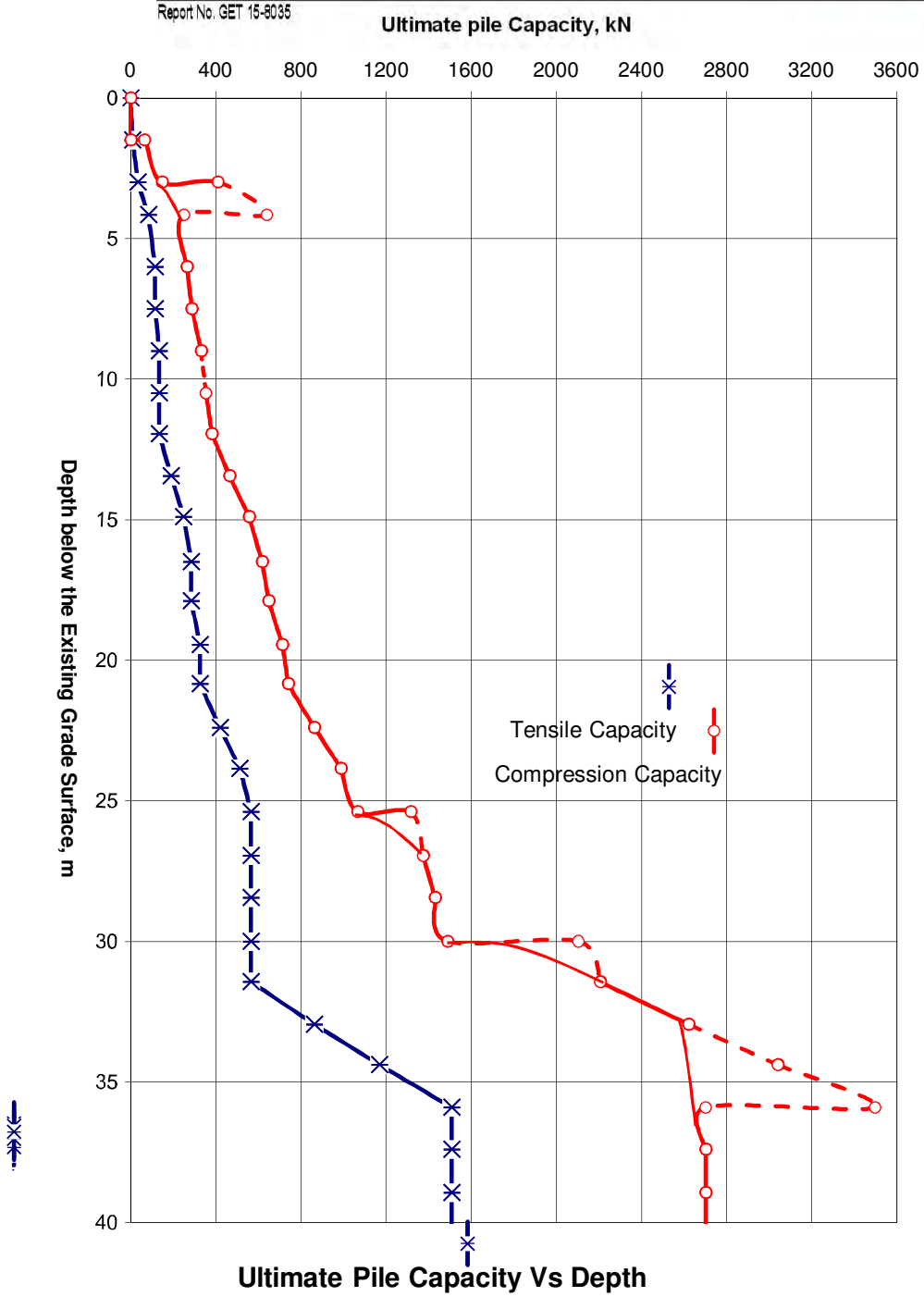
Ultimate Pile Capacity Vs Depth
(Cast-insitu Concrete Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
On-SHORE) TIMOR LESTE)

PLATE- 24c

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



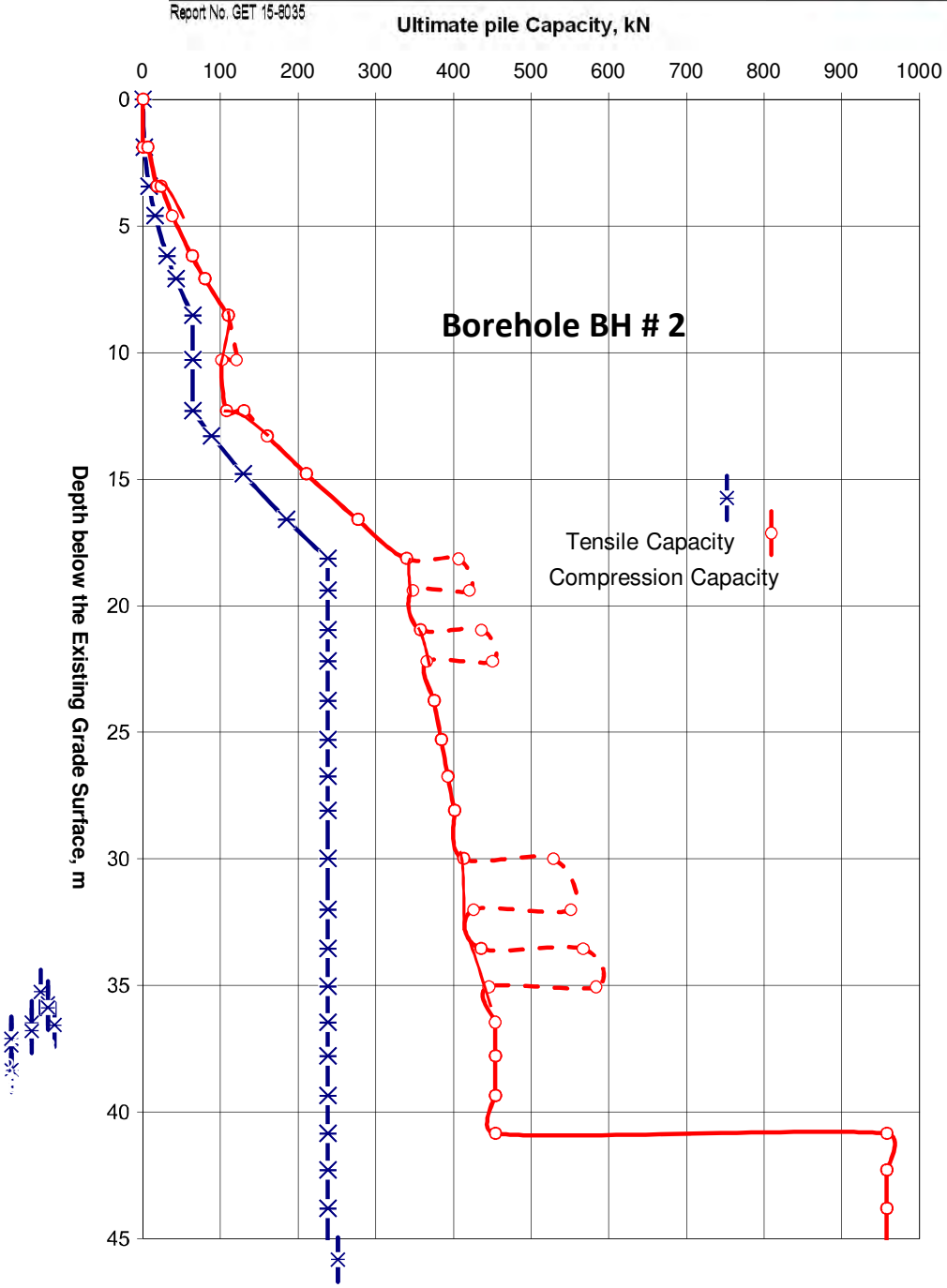
Ultimate Pile Capacity Vs Depth
(Cast-insitu Concrete Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
On-SHORE) TIMOR LESTE)

PLATE- 24d

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



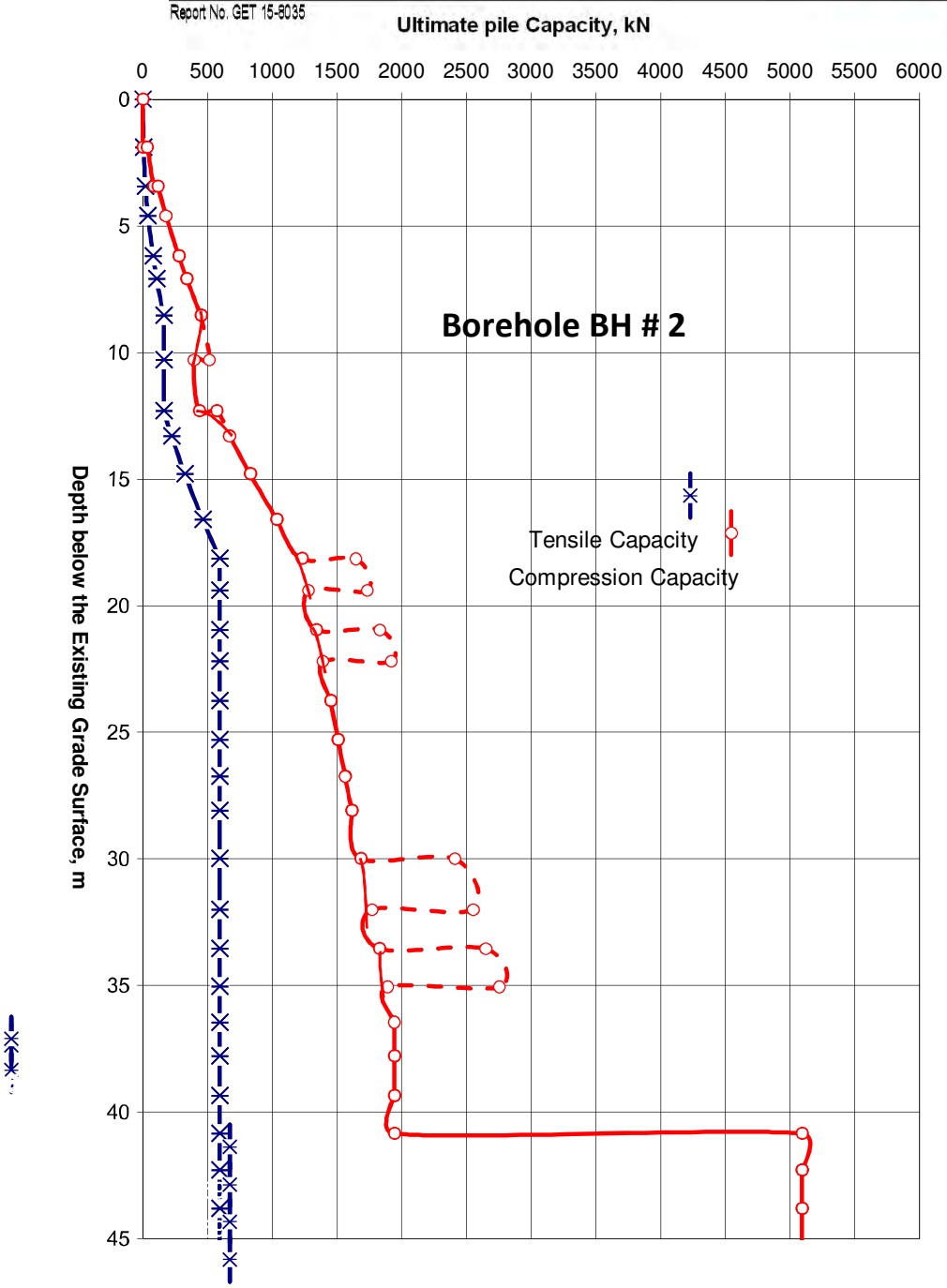
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 25a

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



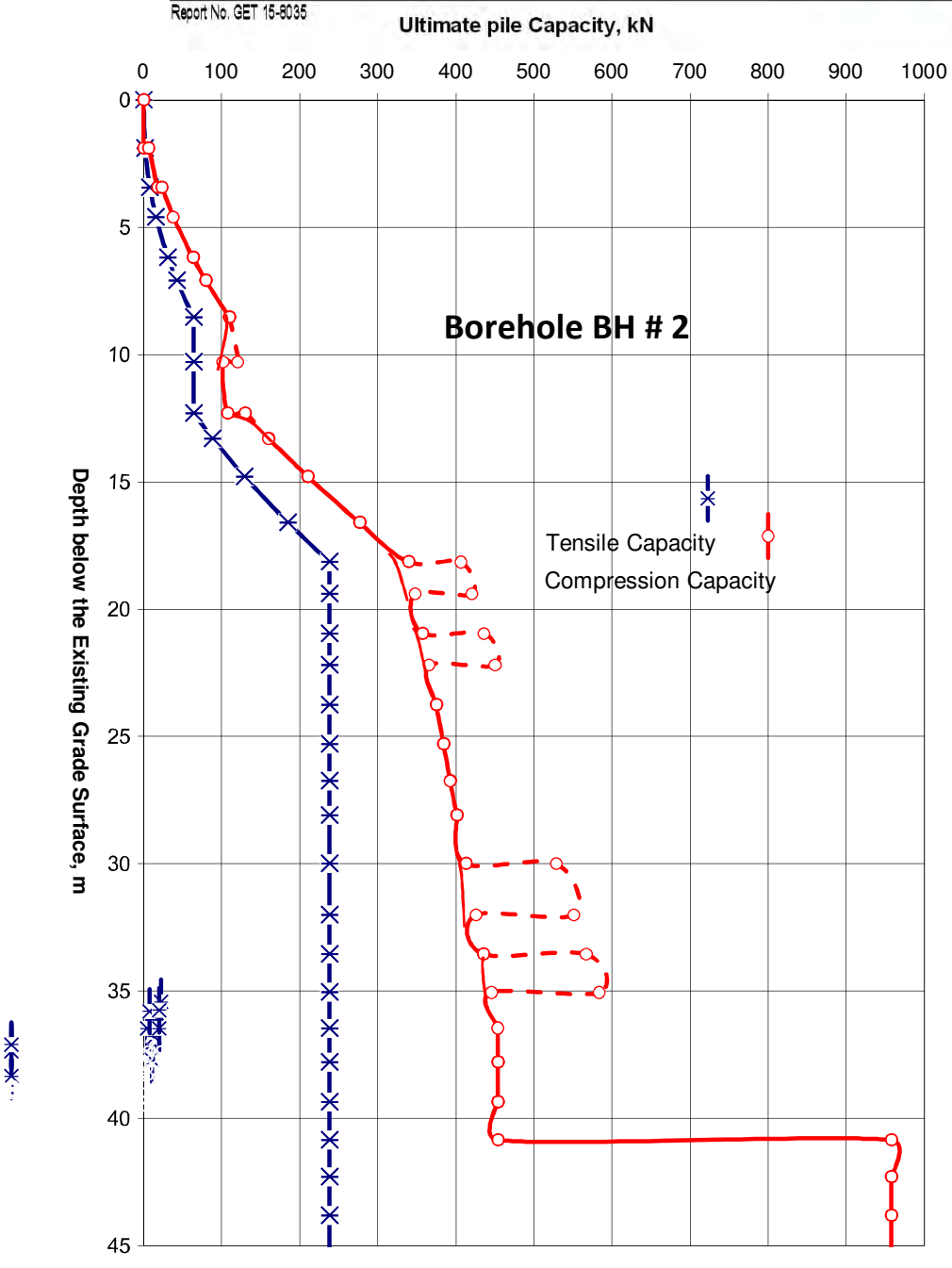
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 25b

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



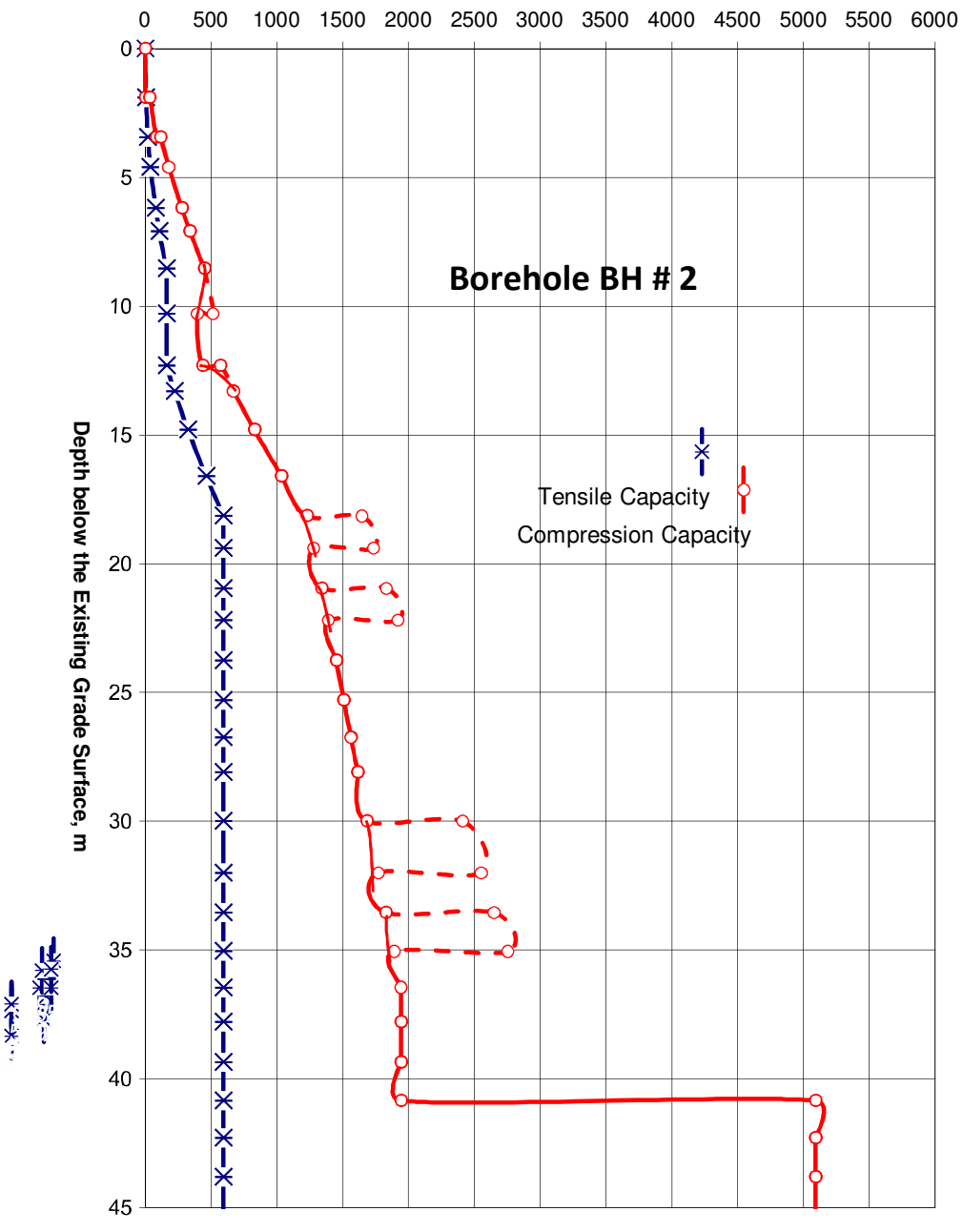
Ultimate Pile Capacity Vs Depth
(Cast-in-situ Concrete Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 25c

Geotechnik Ltd

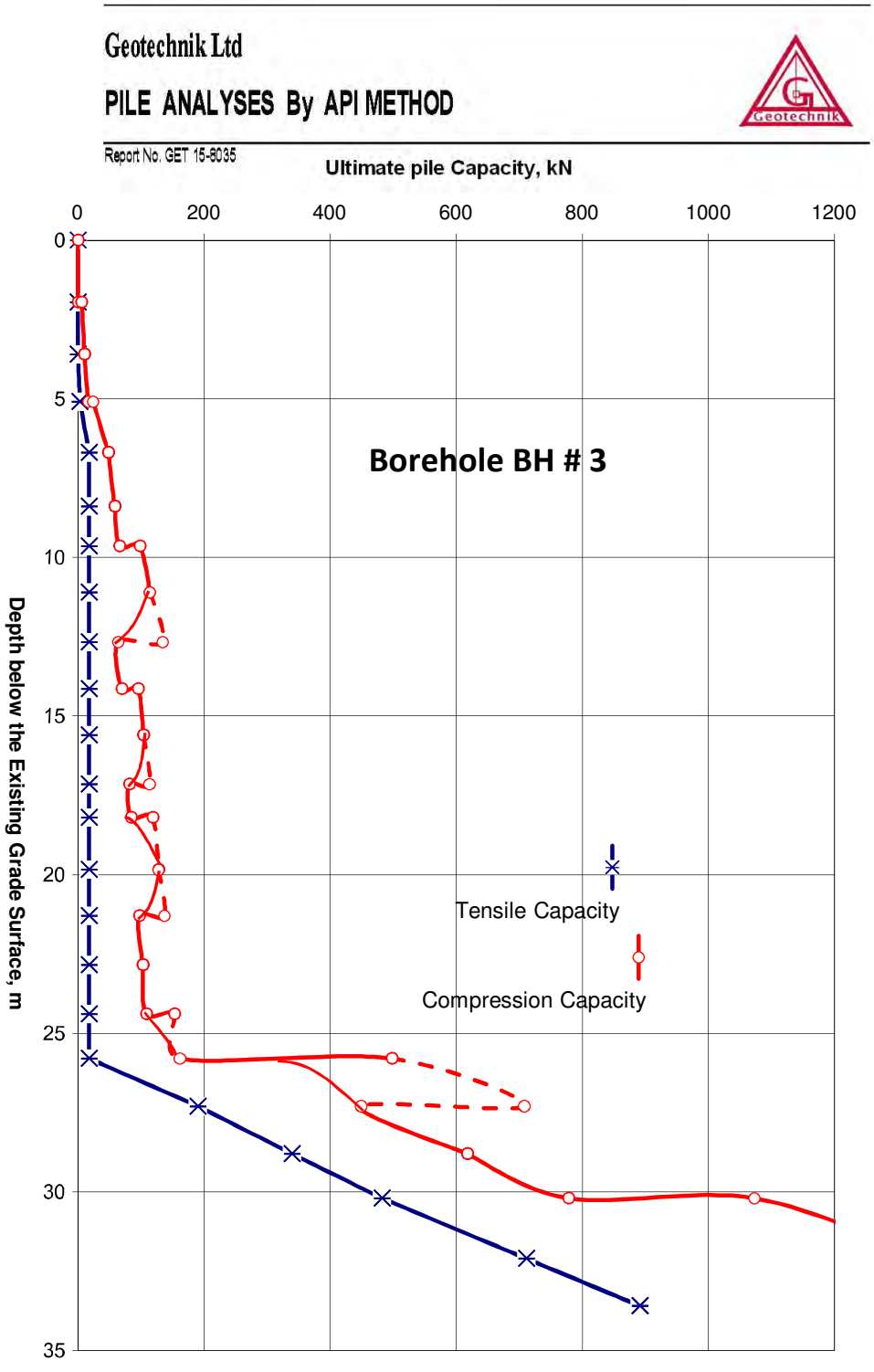
PILE ANALYSES By API METHOD

Report No. GET 15-8035



Ultimate Pile Capacity Vs Depth
(Cast-in-situ Concrete Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 25d



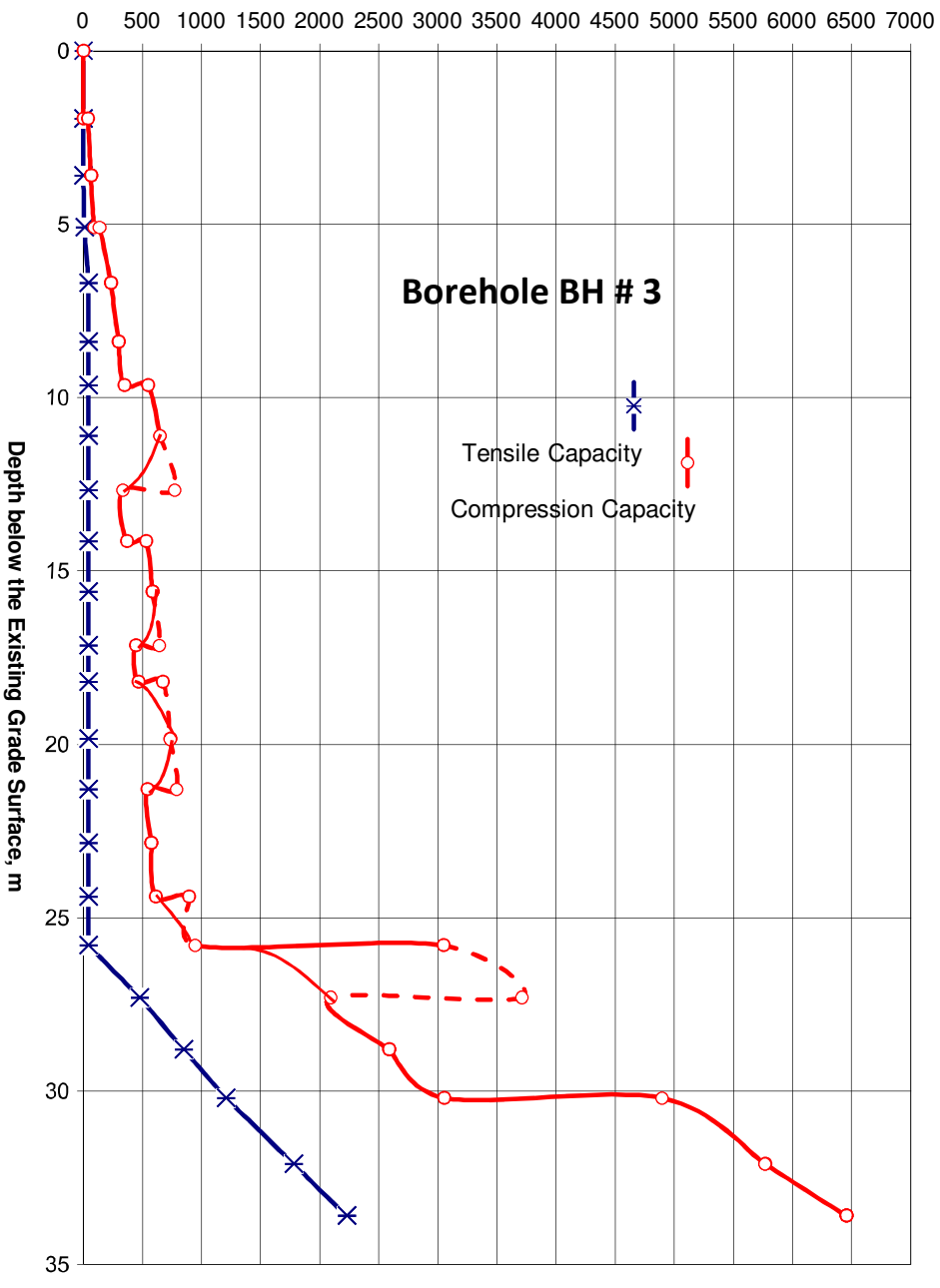
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 26a

Geotechnik Ltd

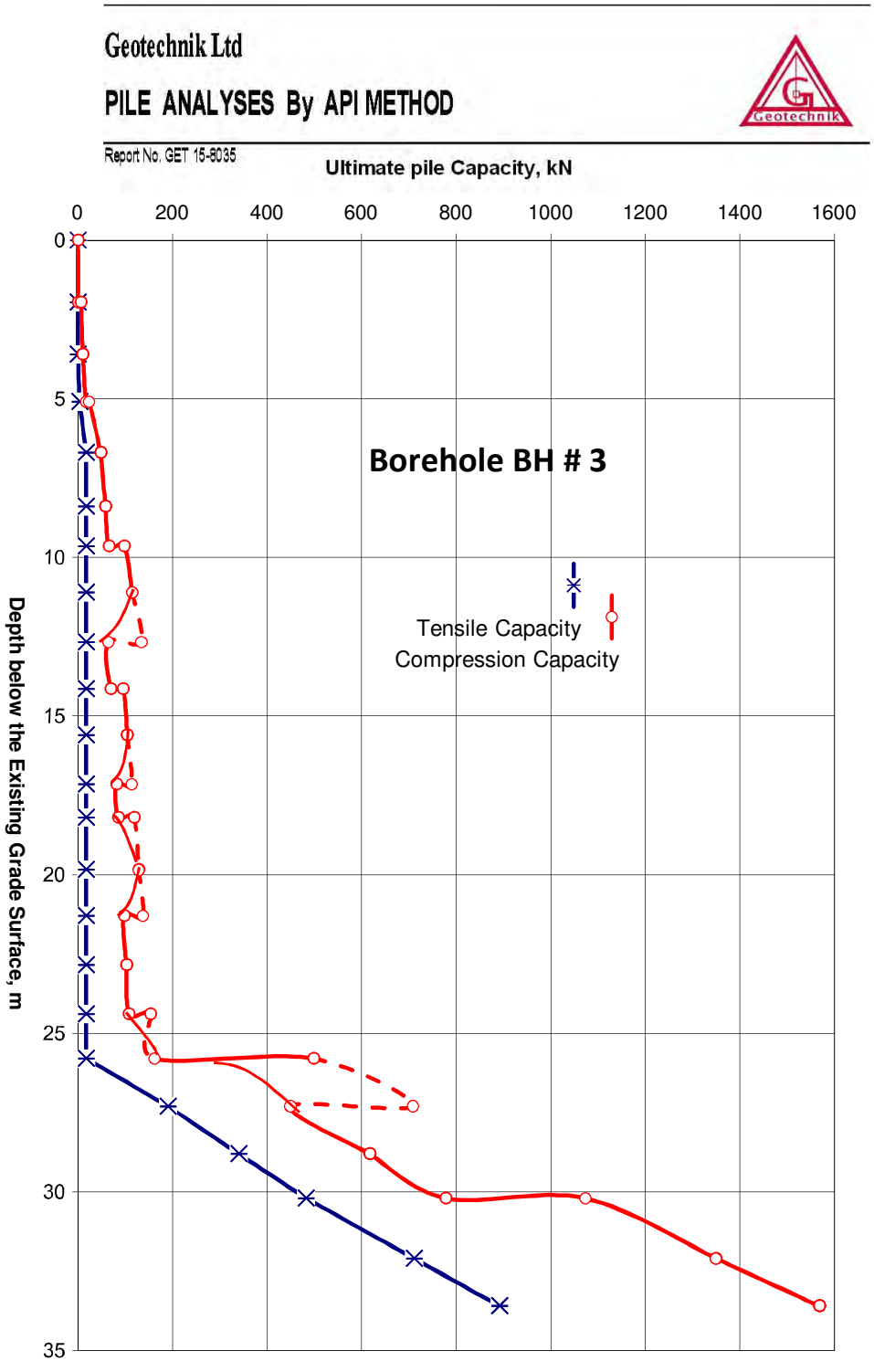
PILE ANALYSES By API METHOD

Report No. GET 15-8035



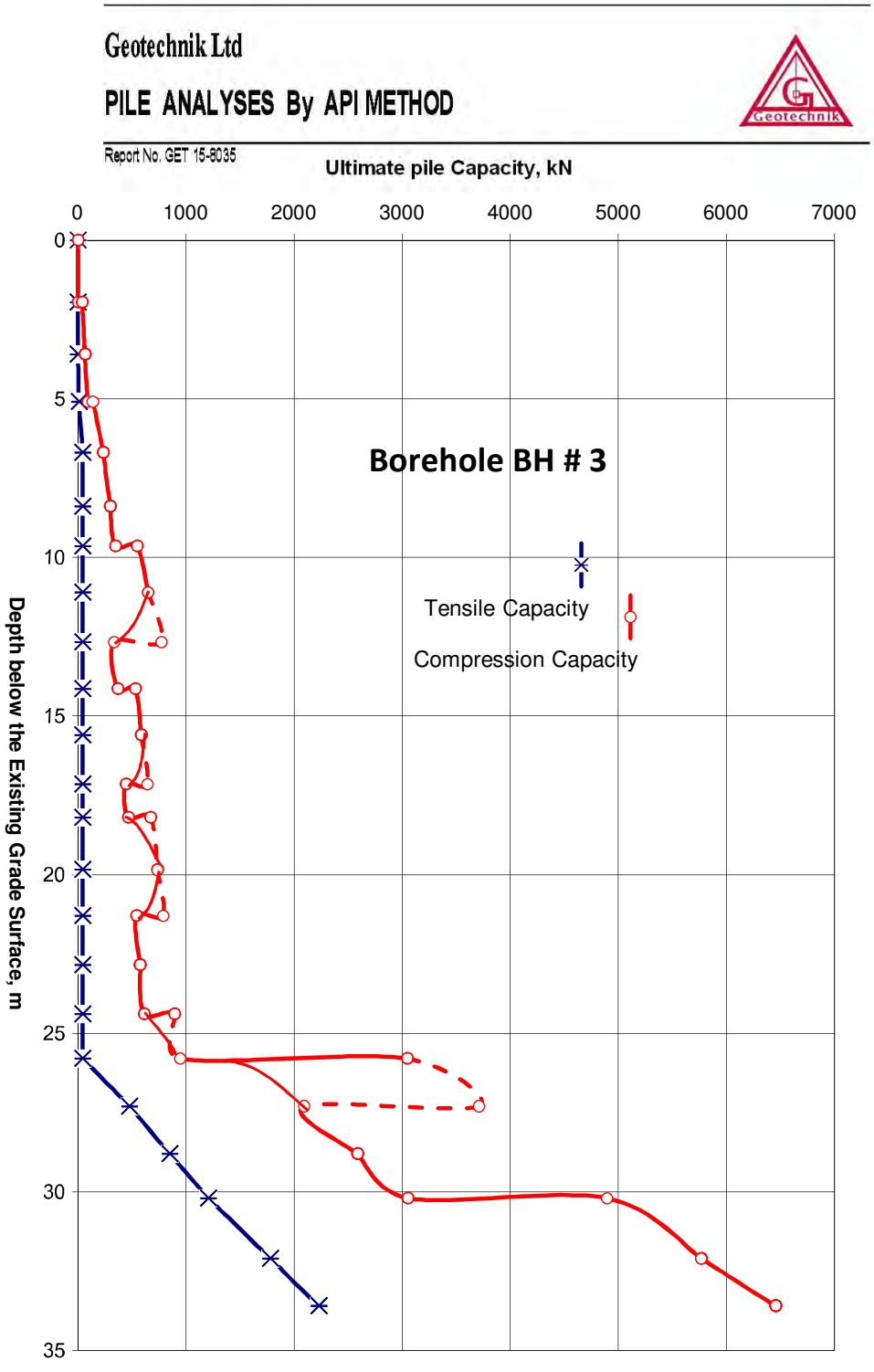
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 26b



Ultimate Pile Capacity Vs Depth
(Cast-in-situ Concrete Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 26c



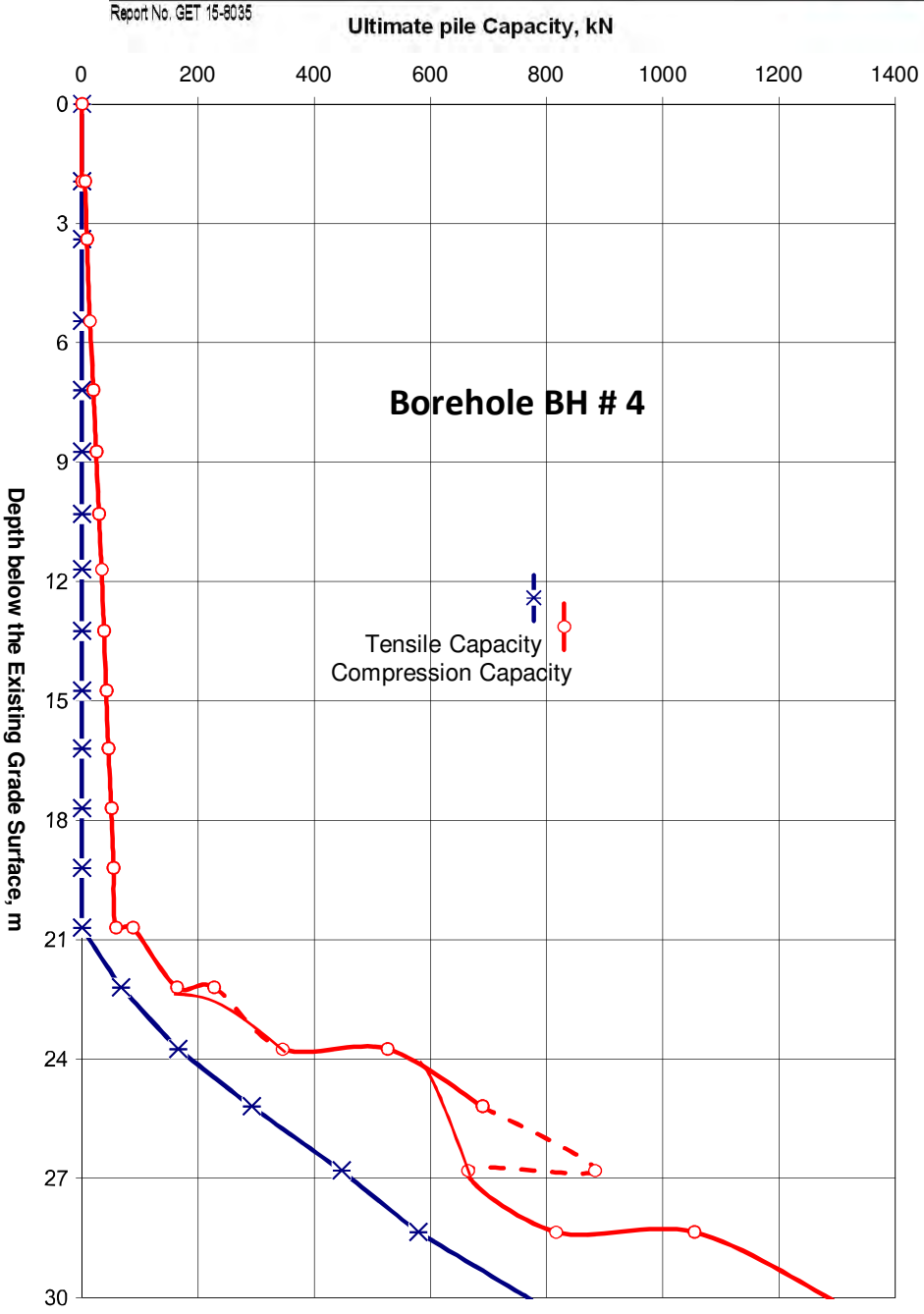
Ultimate Pile Capacity Vs Depth
(Cast-in-situ Concrete Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 26d

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



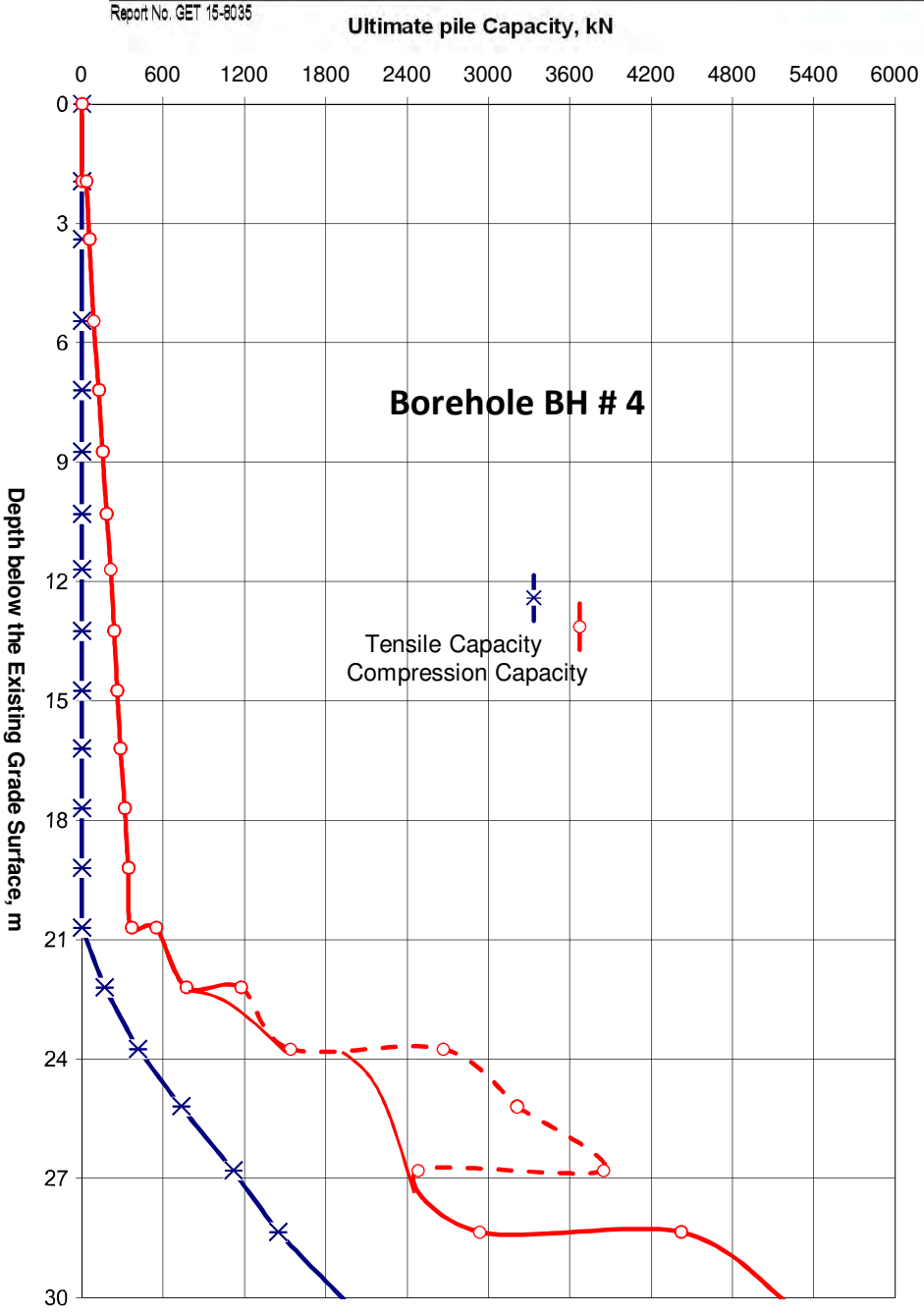
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 27a

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



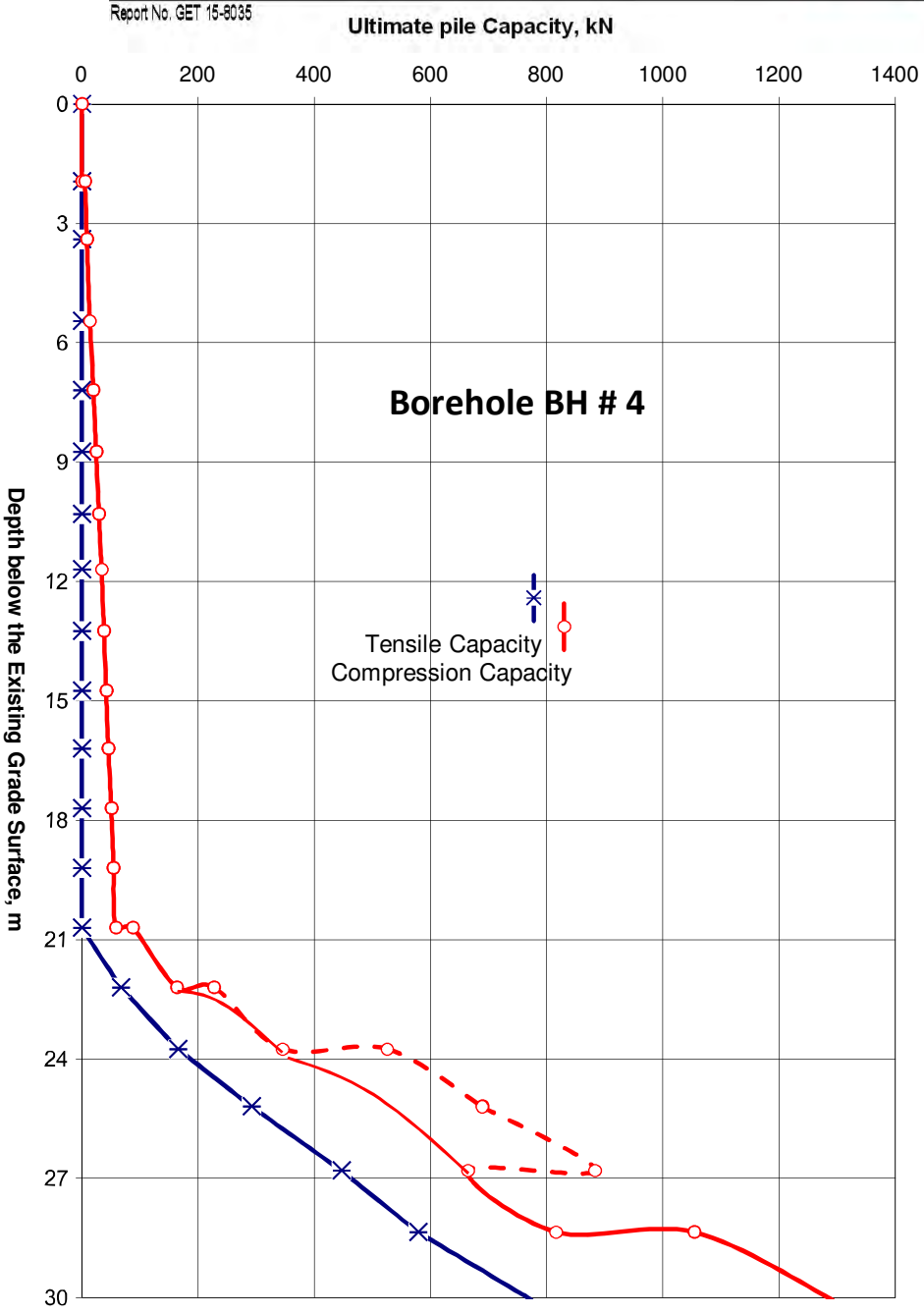
Ultimate Pile Capacity Vs Depth
(Pipe Pre-Cast Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 27b

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



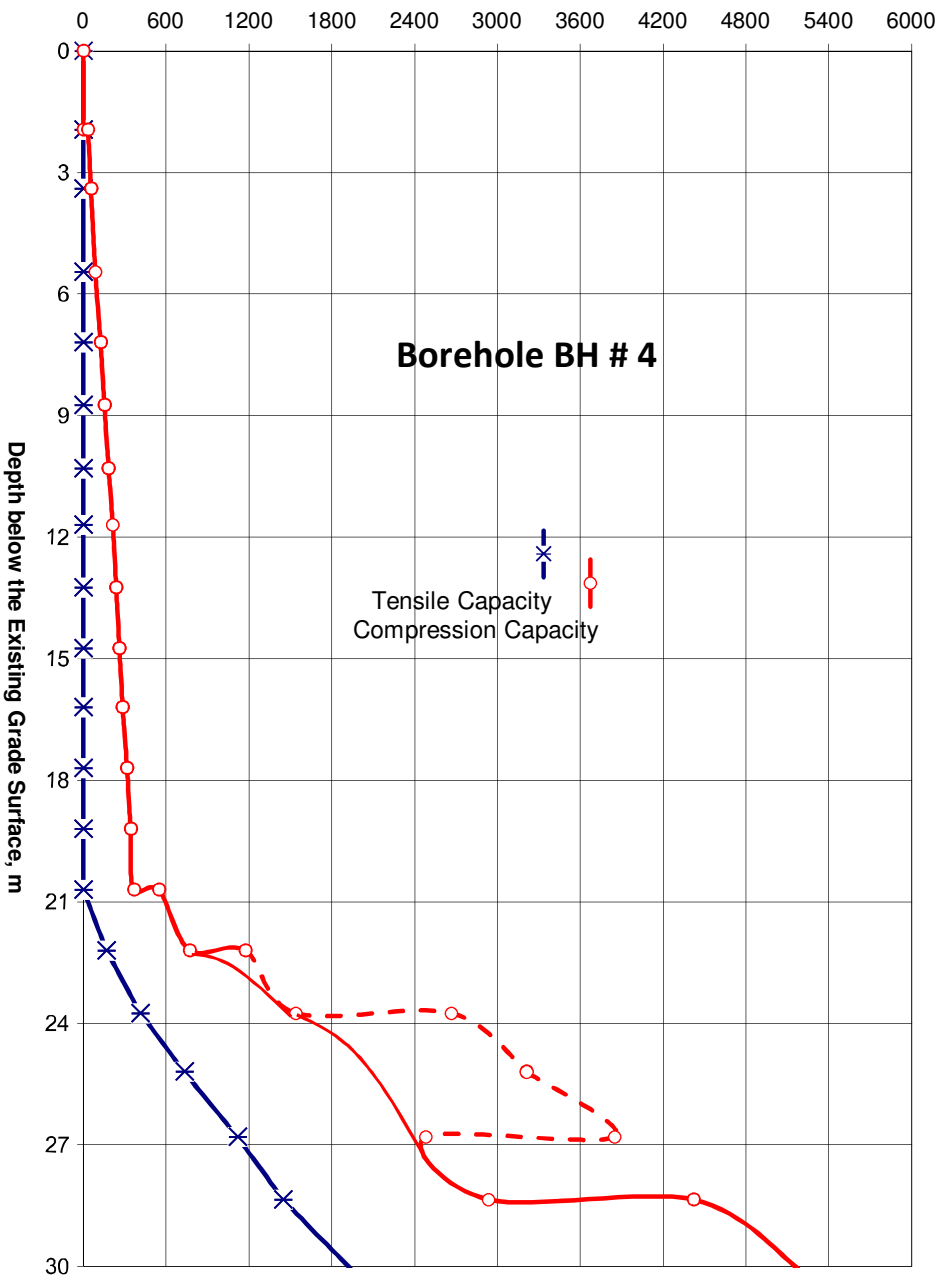
Ultimate Pile Capacity Vs Depth
(Cast-in-situ Concrete Pile (0.4 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 27c

Geotechnik Ltd

PILE ANALYSES By API METHOD

Report No. GET 15-8035



Ultimate Pile Capacity Vs Depth
(Cast-in-situ Concrete Pile (1.0 m Diameter
Urgent Shift of Ferry Terminal In Dili Port Project
Off-SHORE) TIMOR LESTE)

PLATE- 27d

APPENDIX-A

APPENDIX-A
(BORE HOLE LOCATION PHOTOGRAPHS)

Standard Penetration Test in Progress
Bore Hole # 1 Location Photo Graph.
Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste.

Appendix –A-1

Drilling Work in Progress
Bore Hole # 2 Location Photo Graph.
Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste.

Appendix –A-2

Drilling Work in Progress
Bore Hole # 3 Location Photo Graph.
Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste.

Drilling Work in Progress
Bore Hole # 4 Location Photo Graph.
Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste.

APPENDIX-B

(Summary of Gradation Analyses & Liquid Limit and Plastic)

Report No. GET 15-8035

SIEVE PERCENTAGE PASSING

CLIENT: JAPAN PORT CONSULTANTS,LTD

GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE

BORING NO. BH # 01

size (mm)	S-1	S-3	S-5	S-6	S-8	S-9	S - 12	S-14	S-16	S-17	S-18	S-20	S-21	S-22	S-23	S-24	S-26	S-27
37.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
28.00	87.6	100.0	100.0	95.7	100.0	97.2	100.0	100.0	64.1	94.3	100.0	100.0	100.0	100.0	88.3	100.0	100.0	100.0
26.50	87.6	100.0	100.0	93.7	100.0	97.2	91.0	100.0	56.1	94.3	100.0	100.0	100.0	100.0	88.3	100.0	100.0	100.0
20.00	82.7	100.0	100.0	92.1	96.5	90.5	89.1	100.0	56.1	94.3	100.0	100.0	100.0	85.7	81.4	93.8	100.0	100.0
14.00	74.7	86.0	100.0	85.2	90.5	79.3	84.6	92.7	31.8	85.1	100.0	100.0	97.5	84.1	81.4	80.7	100.0	100.0
10.00	65.7	69.9	100.0	83.4	84.1	76.1	79.6	85.3	20.2	79.9	100.0	100.0	95.7	79.6	77.7	72.1	100.0	98.3
6.30	49.1	49.1	100.0	79.7	80.8	71.9	71.4	81.2	16.9	76.2	99.9	100.0	93.4	72.5	65.1	65.2	99.8	98.0
4.75	43.2	35.7	99.9	78.0	79.3	70.5	68.9	75.1	16.0	75.0	99.8	100.0	92.1	67.9	60.0	60.4	99.8	98.0
2.00	31.4	13.8	99.5	73.3	75.0	66.5	63.7	71.9	14.3	72.4	99.6	99.6	88.3	53.3	43.3	47.0	99.7	98.0
1.18	25.6	9.0	99.3	69.3	71.9	63.4	61.4	63.2	13.6	70.9	99.0	99.3	86.3	41.9	33.9	36.0	99.6	98.0
0.425	16.9	4.3	98.7	61.3	66.4	56.7	57.9	59.3	12.1	68.5	98.3	98.7	79.6	26.9	23.2	22.1	99.5	98.0
0.150	8.1	2.1	96.6	50.8	60.5	50.1	54.0	55.2	8.7	65.5	96.7	98.2	64.9	18.2	17.6	14.8	99.3	97.9
0.075	6.2	1.5	89.7	44.2	57.3	48.2	50.2	50.0	8.0	60.8	80.7	96.2	61.0	14.6	12.3	11.9	98.7	97.9

APPENDIX-B1

Geotechnik Ltd

geotechnical and material engineers

SIEVE PERCENTAGE PASSING

Report No. GET 15-8035

CLIENT: JAPAN PORT CONSULTANTS,LTD

GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE

BORING NO. BH # 02

size (mm)	S-1	S-3	S-5	S-6	S-8	S-10	S - 11	S-13	S-16	S-18	S-20	S-21	S-26	S-28	S-30
37.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
28.00	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0
26.50	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0
20.00	100.0	93.6	100.0	100.0	100.0	100.0	100.0	76.1	100.0	100.0	100.0	100.0	100.0	100.0	92.4
14.00	100.0	90.2	92.0	97.9	100.0	100.0	100.0	73.7	100.0	100.0	100.0	100.0	100.0	87.1	92.4
10.00	98.0	86.3	89.8	96.7	95.3	64.0	94.6	71.9	100.0	100.0	100.0	100.0	100.0	82.5	91.8
6.30	95.1	81.3	88.2	94.2	81.8	45.3	92.6	71.2	100.0	100.0	100.0	100.0	100.0	64.1	91.3
4.75	92.4	77.6	86.7	93.3	77.0	35.9	91.2	70.9	99.7	100.0	100.0	100.0	99.6	74.1	91.4
2.00	79.6	58.0	83.4	90.1	71.1	21.8	87.9	69.1	98.8	100.0	100.0	99.9	98.5	66.3	90.5
1.18	64.7	47.3	79.7	86.5	68.7	15.9	85.9	67.1	97.9	99.7	99.8	99.8	97.9	62.0	89.3
0.425	41.8	41.3	69.1	80.5	64.4	9.8	82.9	63.6	97.0	99.5	99.6	99.7	96.5	55.7	85.4
0.150	30.8	35.8	46.1	71.2	60.2	6.5	77.4	61.0	96.3	99.3	98.1	99.7	95.0	50.0	78.4
0.075	13.2	18.3	38.2	60.1	54.9	5.3	59.6	54.3	94.7	98.3	93.7	99.5	93.9	46.6	73.4

Appendix-B2

Geotechnik Ltd

geotechnical and material engineers

Report No. GET 15-8035

SIEVE PERCENTAGE PASSING

CLIENT: JAPAN PORT CONSULTANTS,LTD — **BORING NO. BH # 03**

GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE

size (mm)	S-1	S-2	S-4	S-6	S-8	S-11	S - 14	S-16	S-18	S-20	S-22
37.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
28.00	100.0	100.0	95.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.3
26.50	100.0	100.0	95.2	100.0	100.0	100.0	100.0	100.0	94.8	96.2	93.3
20.00	100.0	100.0	95.2	100.0	100.0	100.0	100.0	100.0	89.8	92.1	93.3
14.00	100.0	99.1	93.0	100.0	100.0	100.0	100.0	100.0	83.1	85.0	84.2
10.00	100.0	96.4	86.1	100.0	100.0	100.0	100.0	100.0	76.1	81.2	78.9
6.30	100.0	93.4	80.2	99.7	99.9	100.0	100.0	99.5	64.2	73.1	71.3
4.75	100.0	91.8	76.5	99.4	99.8	99.7	100.0	99.5	59.0	68.3	67.3
2.00	99.8	88.8	69.2	98.5	99.4	99.4	99.9	99.4	46.6	54.7	54.8
1.18	99.6	86.6	65.8	96.8	98.0	98.9	99.8	99.4	39.5	46.0	47.8
0.425	98.4	83.7	61.7	94.9	96.7	97.9	99.6	99.3	30.1	34.7	39.0
0.150	87.1	74.4	55.0	91.5	94.0	97.2	99.3	99.3	23.1	27.3	32.6
0.075	78.2	49.2	48.8	76.3	69.6	95.3	97.8	99.3	20.1	24.1	29.2

Appendix-B3

Geotechnik Ltd

geotechnical and material engineers

Report No. GET 15-8019

SIEVE PERCENTAGE PASSING

CLIENT: JAPAN PORT CONSULTANTS,LTD **BORING NO. BH # 04**

GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE

size (mm)	S-1	S-4	S-7	S-9	S-10	S-13	S - 14	S-15	S-17	S-18	S-19
37.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
28.00	100.0	100.0	100.0	93.6	100.0	100.0	100.0	100.0	88.2	100.0	100.0
26.50	100.0	100.0	100.0	93.6	100.0	100.0	100.0	100.0	88.2	100.0	100.0
20.00	100.0	100.0	100.0	89.1	100.0	100.0	100.0	94.0	84.2	70.8	100.0
14.00	100.0	100.0	99.0	89.1	100.0	100.0	100.0	87.6	69.4	52.5	94.0
10.00	100.0	100.0	98.1	84.2	99.3	98.7	99.6	83.1	62.1	36.0	91.8
6.30	99.7	99.9	97.1	78.7	99.3	98.7	99.6	76.5	52.1	12.6	89.2
4.75	99.7	99.9	96.3	76.1	99.3	98.7	98.2	70.6	47.2	9.1	87.1
2.00	99.5	99.5	93.7	72.1	99.3	98.3	94.9	54.6	35.0	2.3	81.3
1.18	99.1	98.8	91.0	69.6	99.2	98.1	91.3	45.5	28.6	1.5	78.3
0.425	98.2	98.2	86.5	66.6	99.1	97.6	83.3	32.7	20.1	0.9	73.5
0.150	94.8	96.7	81.6	63.5	98.9	96.7	73.3	23.6	14.4	0.8	69.2
0.075	81.7	78.7	79.6	61.9	98.6	96.2	67.9	20.3	12.2	0.6	65.3

Appendix-B4

Geotechnik Ltd

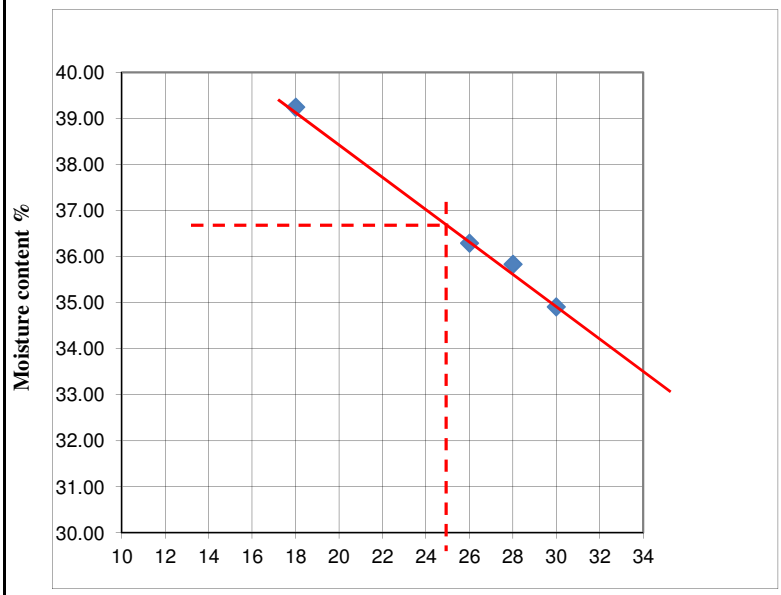
LIQUID LIMIT (Casagrande Method) AND PLASTIC LIMIT

CLIENT: JAPAN PORT CONSULTANTS,LTD	DATE : **8/7/2015**
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE	LAB NO : **GET-15-8035**
	TESTING METHOD : **ASTM-D-4318**

LOCATION **:BH# 1 , S-7**

TYPE OF SAMPLE :SILT with Sand & Gravel (ML)

PLASTIC LIMIT	**Test no.**	**S-20**	**S-20**	**S-20**		
Container no.		**D-1**	**D-3**	**D-5**		
Mass of wet soil + container (A)	g	82.60	83.50	71.00		
Mass of dry soil + container (B)	g	78.20	79.80	68.10		
Mass of container (C)	g	62.50	65.80	57.60		
Mass of moisture (D = A-B)	g	4.40	3.70	2.90		
Mass of dry soil (E = B-C)	g	15.70	14.00	10.50		
Moisture content (W = D x 100 / E)	%	**28.03**	**26.43**	**27.62**		**27.36**
LIQUID LIMIT	**Test no.**	**1**	**1**	**1**	**1**	
Number of bumps		**30**	**28**	**26**	**18**	
Container no.		**D-2**	**D-4**	**D-6**	**D-8**	
Mass of wet soil + container (A)	g	101	86.6	87.1	79.7	
Mass of dry soil + container (B)	g	91.4	79.9	78.5	73.5	
Mass of container (C)	g	63.9	61.2	54.8	57.7	
Mass of moisture (D = A-B)	g	9.60	6.70	8.60	6.20	
Mass of dry soil (E = B-C)	g	27.50	18.70	23.70	15.80	
Moisture content (W = D x 100 / E)	%	**34.91**	**35.83**	**36.29**	**39.24**	



Proportion retained on 425µm sieve ..... %

Liquid Limit	**36.7**	%
Plastic Limit	**27.36**	%
Plasticity index	**9.34**	**ML**

Remarks:

GEOTECHNIK LDA

Appendix-B1Liquid Limit and Plastic BH1, Sample7

Geotechnik Ltd

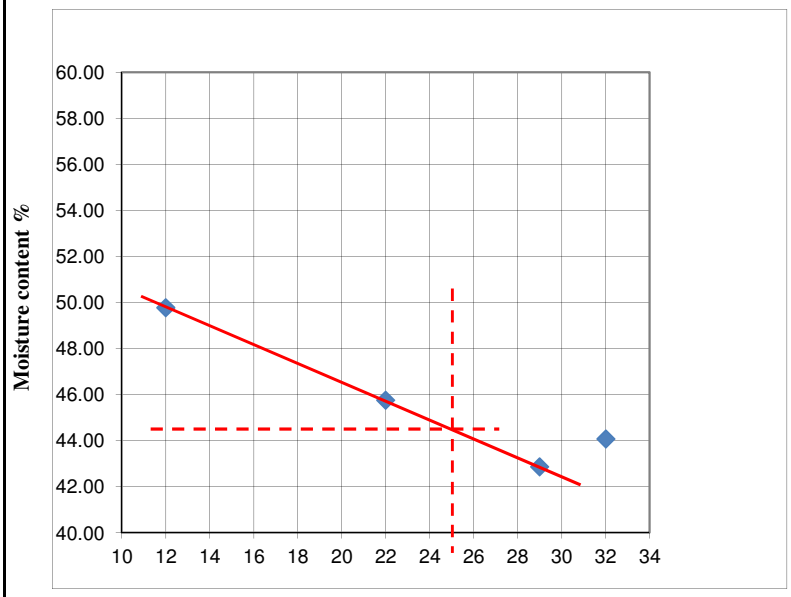
LIQUID LIMIT (Casagrande Method) AND PLASTIC LIMIT

CLIENT: JAPAN PORT CONSULTANTS,LTD	DATE : **8/7/2015**
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE	LAB NO : **GET-15-8035**
	TESTING METHOD : **ASTM-D-4318**

LOCATION **:BH# 1 , S-27**

TYPE OF SAMPLE :ILT (ML), with moderate to high plasticity

PLASTIC LIMIT	**Test no.**	**S-27**	**S-27**	**S-27**	**S-27**	
Container no.		**D-9**	**D-11**	**D-13**	**D-15**	
Mass of wet soil + container (A)	g	78.20	78.80	82.00	84.40	
Mass of dry soil + container (B)	g	74.20	73.80	78.00	78.20	
Mass of container (C)	g	61.60	59.50	64.80	61.30	
Mass of moisture (D = A-B)	g	4.00	5.00	4.00	6.20	
Mass of dry soil (E = B-C)	g	12.60	14.30	13.20	16.90	
Moisture content (W = D x 100) / E	%	**31.75**	**34.97**	**30.30**	**36.69**	**33.43**
LIQUID LIMIT	**Test no.**	**1**	**1**	**1**	**1**	
Number of bumps		**32**	**29**	**22**	**12**	
Container no.		**D-10**	**D-12**	**D-14**	**D-16**	
Mass of wet soil + container (A)	g	97.1	79.2	85.2	92.3	
Mass of dry soil + container (B)	g	87.8	74.7	78.2	81.2	
Mass of container (C)	g	66.7	64.2	62.9	58.9	
Mass of moisture (D = A-B)	g	9.30	4.50	7.00	11.10	
Mass of dry soil (E = B-C)	g	21.10	10.50	15.30	22.30	
Moisture content (W = D x 100) / E	%	**44.08**	**42.86**	**45.75**	**49.78**	



Proportion retained on 425µm sieve ..... %

Liquid Limit	**44.5**	%
Plastic Limit	**33.43**	%
Plasticity index	**11.07**	**ML**

Remarks:

GEOTECHNIK LDA

Appendix-B2 Liquid Limit and Plastic BH1, Sample27

Geotechnik Ltd

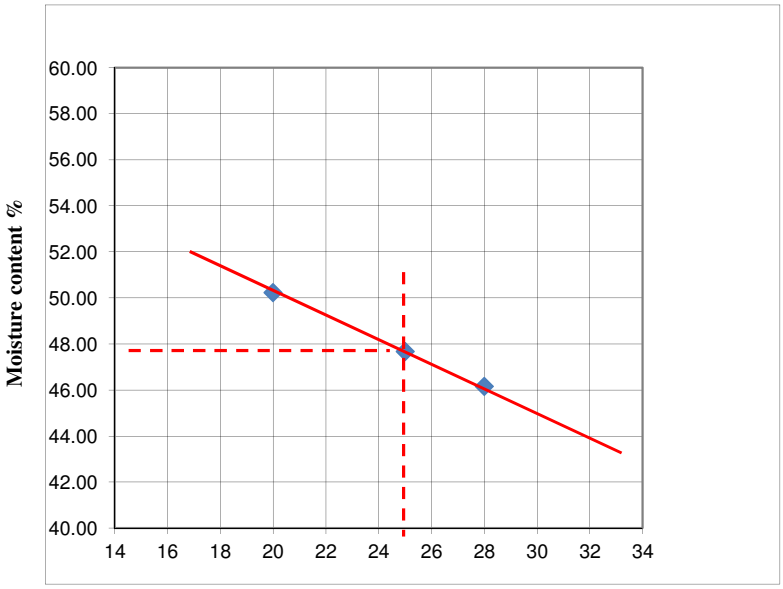
LIQUID LIMIT (Casagrande Method) AND PLASTIC LIMIT

CLIENT: JAPAN PORT CONSULTANTS,LTD	DATE : **8/7/2015**
PROJECT: GEOTECHNICAL SOIL INVESTIGATION FOR URGENT SHIFT OF FERRY TERMINAL IN DILI PORT, TIMOR LESTE	LAB NO : **GET-15-8035**
	TESTING METHOD : **ASTM-D-4318**

LOCATION **:BH-2 S-6**

TYPE OF SAMPLE :SILT with Sand & little Gravel (ML)

PLASTIC LIMIT	**Test no.**	**S-3**	**S-3**			
Container no.		**F-6**	**F-8**			
Mass of wet soil + container (A)	g	45.00	46.30			
Mass of dry soil + container (B)	g	41.00	41.60			
Mass of container (C)	g	29.00	28.00			
Mass of moisture (D = A-B)	g	4.00	4.70			
Mass of dry soil (E = B-C)	g	12.00	13.60			
Moisture content (W = D x 100) / E	%	**33.33**	**34.56**			**33.95**
LIQUID LIMIT	**Test no.**	**S-3**	**S-3**	**S-3**		
Number of bumps		**28**	**25**	**20**		
Container no.		**F-7**	**F-9**	**F-10**		
Mass of wet soil + container (A)	g	62.3	66.1	68.3		
Mass of dry soil + container (B)	g	52.1	53.8	57.6		
Mass of container (C)	g	30	28	36.3		
Mass of moisture (D = A-B)	g	10.20	12.30	10.70		
Mass of dry soil (E = B-C)	g	22.10	25.80	21.30		
Moisture content (W = D x 100) / E	%	**46.15**	**47.67**	**50.23**		



Proportion retained on 425µm sieve ..... %

Liquid Limit	**47.67**	%
Plastic Limit	**33.95**	%
Plasticity index	**13.72**	**ML**

Remarks:

GEOTECHNIK LDA

Appendix-B3 Liquid Limit and Plastic BH-2 S-6

APPENDIX-C
(SAMPLES PHOTOGRAPHS)

BEFORE WASH SAMPLE BH # 1

AFTER WASH SAMPLE BH # 1

Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

Appendix C1

BEFORE WASH SAMPLE BH # 2

AFTER WASH SAMPLE BH # 2

Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

Appendix C2

BEFORE WASH SAMPLE BH # 3

AFTER WASH SAMPLE BH # 3

Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

Appendix B3

BEFORE WASH SAMPLE BH # 4

AFTER WASH SAMPLE BH # 4

Geotechnical Investigation
Urgent Shift of Ferry Terminal In Dili Port
Timor Leste

Appendix C4

Japan Port Consultants, Ltd.

TK Gotanda Bldg, 8-3-6, Nishi-Gotanda,
Shinagawa-ku, Tokyo, Japan

Package-2: Natural and Environmental Survey for Preparatory Survey for the Project of the Urgent Shift of Ferry Terminal in Dili Port

Reference Contract Agreement, July 2015 by and between Japan Port Consultants, Ltd., (Tokyo, Japan), and PT. GEOMARINDEX (Jakarta, Indonesia)

FINAL REPORT
VOLUME 3 ENVIRONMENTAL QUALITY SURVEY

Submitted to: **Japan Port Consultants, Ltd.**
TK Gotanda Bldg, 8-3-6, Nishi-Gotanda,
Shinagawa-ku, Tokyo, Japan

Submitted by:

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Issued Date: **October 26, 2015**

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VOLUME 3
ENVIRONMENTAL QUALITY SURVEY

3.1 PROJECT AND AGREEMENT CONTRACT ASSIGNMENT

Project:
Project of the Urgent Shift of Ferry Terminal in Dili Port, Timor Leste. Geographically, it locates at South Latitude: 8° 33' 05.1991" and East Longitude 125° 34' 19.7262" as shown in **Figure 3.2** Location Map of Sampling Point.

Agreement contract assignment:
Package-2: Natural and Environmental Survey for Preparatory Survey for the Project of the Urgent Shift of Ferry Terminal in Dili Port.

Reference Agreement:
Between **Japan Port Consultants, Ltd.,** and **PT. Geomarindex** dated July 2015.
Subject: Natural and Environmental Survey

It has geographic coordinates at South Latitude: 8°33'05.1991" and East Longitude 125°34'19.7262"

Figure 3.1 Photograph of the Project Site

3.2 THE OBJECTIVE

The objective of quality sampling and laboratory testing is to collect the samples from the project site and around, and send them to laboratory for quality parameter testing, such as: air quality, noise level, water quality, and bottom sediment quality.

3.3 SCOPE OF WORK

The contents of scope of work are as follow:

Table 3.1 Scope of Work Contents

CATEGORY	POINT, LAYER, FREQUENCY	ITEMS
Water Quality	5 points x 1 layer (surface); 1 time (estimation 2 or 3 days parallel with sedimentation sampling)	Coordinates, sampling date and time, depth, water color, smell, water temperature, salinity, pH, turbidity, DO, SS, COD, E-Coli, oil content, T-N, T-P
Bottom Sediment	5 points x 1 layer (surface); 1 time (estimation 2 or 3 days parallel with water quality sampling)	Coordinates, sampling date and time, depth, soil temperature, soil color, smell, characteristics, specific gravity, water content, grain size composition, TOC, TPH, arsenic, cadmium, chrome, lead, mercury, copper, nickel, zinc, TBP
Noise	3 points x 1 time; 24 hours (estimation 3 days)	Equivalent sound level
Air Quality	3 points x 1 time; 24 hours (estimation 6 days)	SO_2, NO_2, Oxidant, CO, TSP, PM10, PM2.5, Hydrocarbon, Lead

The location points where the samples were taken are shown in **Figure 3.2** below.

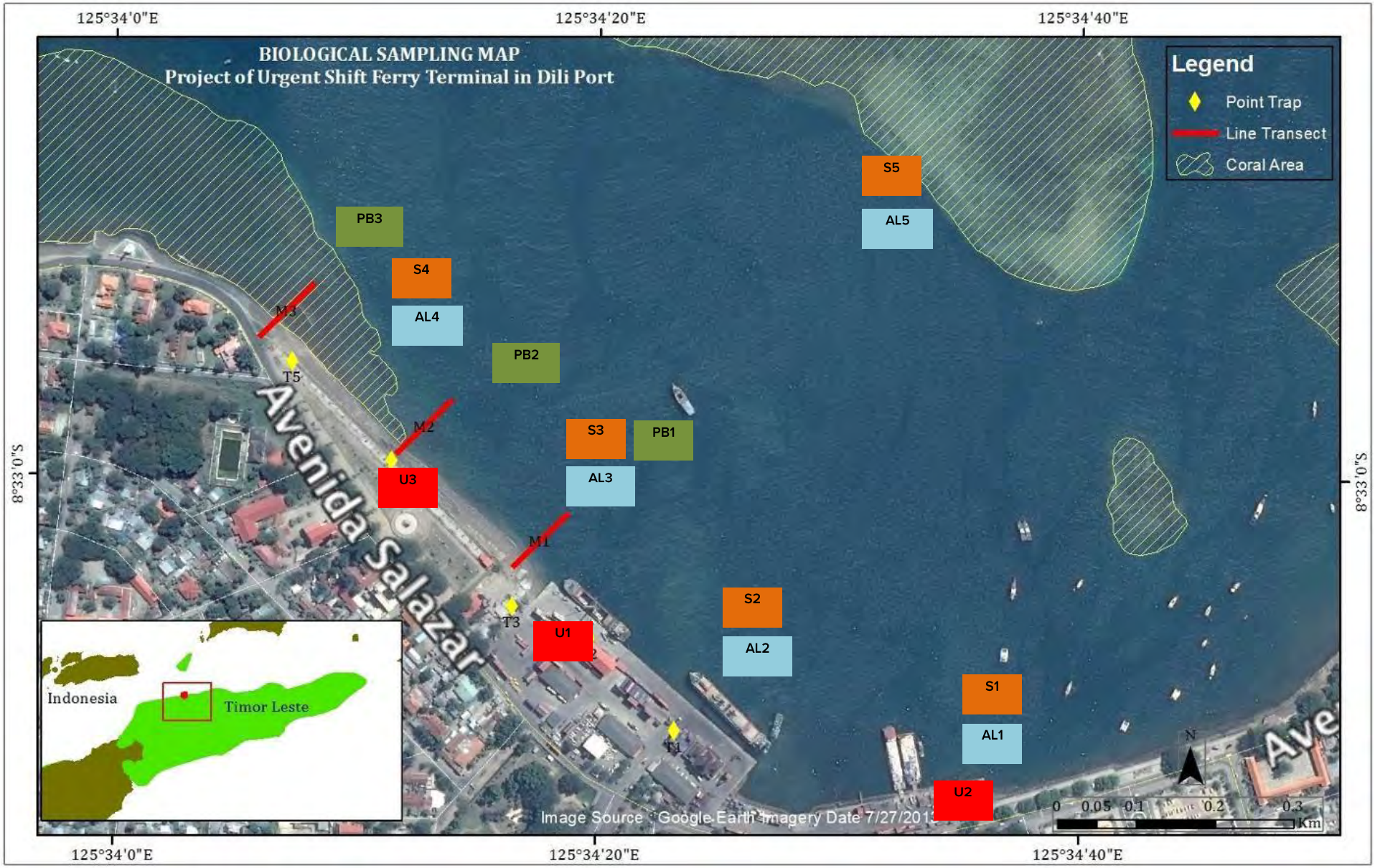

Figure 3.2 Location Map of Sampling Points

3.4 PERFORMANCE OF METHODOLOGY

Methodology for implementing this sampling is presented below.

3.4.1 Sea Water Quality and Plankton (Code: AL)

a. Methodology of Data Collection

Sample of water was taken by water sampler, subsequently insitu testing was carried out to measure some of parameters. Plankton test was carried out by sea water sampling at mid layer and sampling for suspended solid at the seabed that contains grains of soil or sediment was carried out. Those samples were sent to the laboratory for analysis.

b. Methodology of Data Analysis

Quality parameters of sea waters were analyzed in respect to the physical and chemical characteristics. Some parameters that are rapidly changing were measured in the field (in situ) and other parameters were examined in the laboratory using SNI-06-2412-1991 (SNI = Standard Nasional Indonesia) as sampling method. The examined parameters were depth, water color, smell, water temperature, salinity, pH, turbidity, DO, Suspended Solid, COD, E-Coli, oil content, Total Nitrogen, Total Phosphporous. Whilst plankton test was caried out in laboratory by measuring its amount in every sampling location.

c. Location

Sea water sampling locations are shown in **Figure 3.2** and samples were taken at 5 points and 1 layer in each point.

Figure 3.3 Sea Water Quality Sampling Activity

d. Test Result

Below is test results of sea water around the survey area.

Table 3.2 Sea Water Quality Sampling Result

Sample Item : **Sea Water (AL 1)**
Coordinate : S 08° 33' 11,3" E 125° 34' 36,1"
Sampling Method : SNI-06-2412-1991
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Phosphate (PO_4)*)	mg/L	0,02	Max. 0,015	Fail	18-27/IK/ALT
2	Salinity	‰	39	33 to 34	Fail	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Not found	Fail	Extraction-spectrophotometry
4	Turbidity	NTU	1	<5	Pass	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) insitu	mg/L	3	>5	Fail	SNI 06-6989.14-2004
6	pH (insitu) *)	-	8	7 to 8,5	Pass	SNI 06-6989.11-2004
7	Temperature (insitu) *)	°C	29	28 to 30	Pass	SNI 06-6989.23-2005
8	Total Coliforms	MPN/100ml	3	Max. 1000	Pass	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solids (TSS)	mg/L	<2	Max. 20	Pass	SNI 06-6989.3-2004
10	COD	mg/L	45	-	-	SNI 06-6989.15-2004
11	Total Nitrogen (as N)	mg/L	2	-	-	Water Research Methods Chapter XI -1984
12	Total Dissolved Solids (TDS)	mg/L	38.300	-	-	SNI 06-6989.27-2005

*Description : *) = Parameter Accreditation by KAN No. LP-195-IDN*
< = Smaller than
*Criteria using **Environmental Ministry Decree of Republic Indonesia No. 51 of 2004 about Sea Water Quality Standard for Marine Biota***

Sample Item : **Sea Water (AL 2)**
Coordinate : S 08° 33' 09,6" E 125° 34' 28,5"
Sampling Method : SNI-06-2412-1991
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Phosphate (PO_4)*)	mg/L	<0,01	Max.	Fail	18-27/IK/ALT

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
				0,015		
2	Salinity	‰	38	33 to 34	Fail	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Not found	Fail	Extraction-spectrophotometry
4	Turbidity	NTU	2	<5	Pass	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) insitu	mg/L	3	>5	Fail	SNI 06-6989.14-2004
6	pH (insitu) *)	-	8	7 to 8,5	Pass	SNI 06-6989.11-2004
7	Temperature (insitu) *)	°C	29	28 to 30	Pass	SNI 06-6989.23-2005
8	Total Coliforms	MPN/100ml	4	Max. 1000	Pass	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solids (TSS)	mg/L	<2	Max. 20	Pass	SNI 06-6989.3-2004
10	COD	mg/L	46	-	-	SNI 06-6989.15-2004
11	Total Nitrogen (as N)	mg/L	5	-	-	Water Research Methods Chapter XI -1984
12	Total Dissolved Solids (TDS)	mg/L	39.200	-	-	SNI 06-6989.27-2005

*Description : *) = Parameter Accreditation by KAN No. LP-195-IDN*
< = Smaller than
*Criteria using **Environmental Ministry Decree of Republic Indonesia No. 51 of 2004 about Sea Water Quality Standard for Marine Biota***

Sample Item : **Sea Water (AL 3)**
Coordinate : S 08° 33' 03,5" E 125° 34' 23,7"
Sampling Method : SNI-06-2412-1991
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Phosphate (PO_4)*)	mg/L	0,01	Max. 0,015	Fail	18-27/IK/ALT
2	Salinity	‰	38	33 to 34	Fail	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Not found	Fail	Extraction-spectrophotometry
4	Turbidity	NTU	1	<5	Pass	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) insitu	mg/L	3	>5	Fail	SNI 06-6989.14-2004
6	pH (insitu) *)	-	8	7 to 8,5	Pass	SNI 06-6989.11-2004
7	Temperature (insitu) *)	°C	30	28 to 30	Pass	SNI 06-6989.23-2005

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
8	Total Coliforms	MPN/100ml	4	Max. 1000	Pass	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solids (TSS)	mg/L	<2	Max. 20	Pass	SNI 06-6989.3-2004
10	COD	mg/L	40	-	-	SNI 06-6989.15-2004
11	Total Nitrogen (as N)	mg/L	2	-	-	Water Research Methods Chapter XI -1984
12	Total Dissolved Solids (TDS)	mg/L	38.300	-	-	SNI 06-6989.27-2005

*Description : *) = Parameter Accreditation by KAN No. LP-195-IDN*
< = Smaller than
*Criteria using **Environmental Ministry Decree of Republic Indonesia No. 51 of 2004 about Sea Water Quality Standard for Marine Biota***

Sample Item : **Sea Water (AL 4)**
Coordinate : S 08° 32' 55,2" E 125° 34' 15,3"
Sampling Method : SNI-06-2412-1991
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Phosphate (PO_4)*)	mg/L	0,01	Max. 0,015	Fail	18-27/IK/ALT
2	Salinity	‰	39	33 to 34	Fail	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Not found	Fail	Extraction-spectrophotometry
4	Turbidity	NTU	3	<5	Pass	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) insitu	mg/L	4	>5	Fail	SNI 06-6989.14-2004
6	pH (insitu) *)	-	8	7 to 8,5	Pass	SNI 06-6989.11-2004
7	Temperature (insitu) *)	°C	29	28 to 30	Pass	SNI 06-6989.23-2005
8	Total Coliforms	MPN/100ml	3	Max. 1000	Pass	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solids (TSS)	mg/L	<2	Max. 20	Pass	SNI 06-6989.3-2004
10	COD	mg/L	34	-	-	SNI 06-6989.15-2004
11	Total Nitrogen (as N)	mg/L	2	-	-	Water Research Methods Chapter XI -1984
12	Total Dissolved Solids (TDS)	mg/L	38.900	-	-	SNI 06-6989.27-2005

*Description : *) = Parameter Accreditation by KAN No. LP-195-IDN*
< = Smaller than
*Criteria using **Environmental Ministry Decree of Republic Indonesia No. 51 of 2004 about Sea Water Quality Standard for Marine Biota***

Sample Item : **Sea Water (AL 5)**
Coordinate : S 08° 32' 59,3" E 125° 34' 27,7"
Sampling Method : SNI-06-2412-1991
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Phosphate (PO_4)*)	mg/L	<0,01	Max. 0,015	Fail	18-27/IK/ALT
2	Salinity	‰	39	33 to 34	Fail	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Not found	Fail	Extraction-spectrophotometry
4	Turbidity	NTU	2	<5	Pass	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) insitu	mg/L	4	>5	Fail	SNI 06-6989.14-2004
6	pH (insitu) *)	-	8	7 to 8,5	Pass	SNI 06-6989.11-2004
7	Temperature (insitu) *)	°C	29	28 to 30	Pass	SNI 06-6989.23-2005
8	Total Coliforms	MPN/100ml	<3	Max. 1000	Pass	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solids (TSS)	mg/L	<2	Max. 20	Pass	SNI 06-6989.3-2004
10	COD	mg/L	26	-	-	SNI 06-6989.15-2004
11	Total Nitrogen (as N)	mg/L	2	-	-	Water Research Methods Chapter XI -1984
12	Total Dissolved Solids (TDS)	mg/L	39.400	-	-	SNI 06-6989.27-2005

*Description : *) = Parameter Accreditation by KAN No. LP-195-IDN*
< = Smaller than
*Criteria using **Environmental Ministry Decree of Republic Indonesia No. 51 of 2004 about Sea Water Quality Standard for Marine Biota***

Table 3.3 Plankton Sampling Result

Sample Item : **Plankton**
: P1. Sea Water (AL 3)
: P2. Between (AL3- AL4)
: P3. Sea Water (AL 4)
Coordinate : P1. S 08° 33' 03,5" E 125° 34' 23,7"
: P2. S 08° 32' 57,0" E 125° 34' 18,0"
: P3. S 08° 32' 55,2" E 125° 34' 15,3"
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

Fitopankton

NO	INDIVIDUAL	AL 4	AL1	AL3
CYANOPHYTA				
1	Oscillatoria sp. 1	75	33	47

NO	INDIVIDUAL	AL 4	AL1	AL3
2	Oscillatoria sp. 2		35	9
CHRYSOPHYTA				
3	**Amphiprora sp.**		2	1
4	**Bacteriastrum sp.**	14	8	12
5	Biddulphia sp.	13	7	19
6	Ceratailina sp.			14
7	Chaetoceros laeve	15	13	21
8	Chaetoceros sp. 1	38	29	49
9	Chaetoceros sp. 2	36	28	56
10	Chaetoceros sp. 3	34	26	54
11	Chaetoceros sp. 4	25	28	20
12	Chaetoceros sp. 5		5	
13	Climacospenia sp.	6	3	5
14	Coscinodiscus jonesianus	29	18	31
15	Coscinodiscus sp. 1	31	18	15
16	Coscinodiscus sp. 2	48	28	51
17	Coscinodiscus sp. 3		3	
18	Flagillaria sp.1	12	4	33
19	Flagillaria sp.2	12	19	33
20	Hemidiscus sp.	11	5	4
21	Licmophora sp.	7	3	2
22	Navicula sp. 1		3	6
23	Navicula sp. 2	18	29	38
24	Nitzschia seriata	21	17	28
25	Nitzschia sp. 1	18	12	26
26	Nitzschia sp. 2	4	2	4
27	Planktoniella sp.	4	2	1
28	Pleurosigma sp. 1	4	2	14
29	Pleurosigma sp. 2	33	24	18
30	Pleurosigma sp. 3	4	5	12

Zooplankton

NO	INDIVIDUAL	AL 4	AL 1	AL 3
ARTRHOPODA				
CRUSTACEA				
COPEPODA				
1	Centrophagus sp.	5	2	
2	Corycaeus sp.	4	2	3
3	Microsetella sp.	2	13	8
4	Oithona sp. 1	3	2	5
5	Oithana sp. 2	3		
6	Oncaena sp.	7	5	3
7	**HARPATICOIDA**			
8	**COPEPODA (1, nauplius)**	2	3	3
9	**COPEPODA (2, nauplius)**	4	8	6
10	**COPEPODA (1, copepodite)**	6	4	3
11	**COPEPODA (1, copepodite)**	1		5
PROTOZOA				
CILIOPHORA				
FLAGELLATA				
12	FLAGELLATA (1))		5	
13	FLAGELLATA (2))		15	4
TINTINNIDA				
14	Codonellopsis sp.		3	
15	Rhabdonella sp.	7	4	3
16	Tintinnidae	9	3	2
TROCHELMINTHES				
ROTATORIA				
17	ROTATORIA (1)	2		
Total Individual/L		55	69	45

NO	INDIVIDUAL	AL 4	AL 1	AL 3
Total Taxa		13	13	11
Diversity Index H' = - E pi Ln pi		**2.41**	**2.32**	**2.32**
(SHANNON – WIENER, 1949)				
H-max = Ln S		2.56	2.56	2.40
Equitaility (E) = H'/H-max		0.94	0.91	0.97

Criteria:
Diversity index standard/criteria of Shannon-Wiener divided into 3 (three), namely:
H' < 1 = Low Diversity Index
1 < H' < 3 = Middle Diversity Index
H' > 3 = High Diversity Index

3.4.2 Bottom Sediment (Code: S)

a. Methodology of Data Collection

Samples of sediment were taken by using grab sampler method and were taken custody in plastic containers that were labeled, and they were analyzed in laboratory.

b. Methodology of Data Analysis

The examined parameters by using SNI 13-4720-1998 and USEPA SW 846-3050B method are depth, soil temperature, soil color, smell, characteristics, specific gravity, water content, grain size composition, Total Organic Carbon, Total Petroleum Hidrocarbon, arsenic, cadmium, chrome, lead, mercury, copper, nickel, zinc, and Tributylin (TBP).

c. Location

Bottom sediment sampling locations are shown in **Figure 3.2** and samples were taken at 5 points and 1 layer at each point.

Figure 3.4 Bottom Sediment Sampling Activity

d. Test Result

Results of sediment test are shown below.

Table 3.4 Bottom Sediment Sampling Result

Sample Item : **Sediment (S 1)**
Coordinate : S 08º 33' 11,3" E 125º 34' 36,1"
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Organic Carbon (TOC)	%	0,85	-	-	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	Max. 9,8	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	<0,5	Max. 0,99	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	Max. 0,18	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	21	Max. 120	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	5	Max. 32	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	Max. 43	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	<5	Max. 36	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	<3	Max. 23	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
10	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	-	-	UESPA 8440 1996

Description : < = Smaller than
Criteria from ***Wisconsin Department of Natural Resources***

Sample Item : **Sediment (S 2)**
Coordinate : S 08º 33' 09,6" E 125º 34' 28,5"
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Organic Carbon (TOC)	%	0,79	-	-	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	Max. 9,8	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	3	Max. 0,99	Fail	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	Max. 0,18	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	143	Max. 120	Fail	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
6	Copper (Cu)	mg/kg	20	Max. 32	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	Max. 43	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	8	Max. 36	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	<3	Max. 23	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
10	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	-	-	UESPA 8440 1996

Description : < = Smaller than
Criteria from ***Wisconsin Department of Natural Resources***

Sample Item : **Sediment (S 3)**
Coordinate : S 08° 33' 03,5" E 125° 34' 23,7"
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Organic Carbon (TOC)	%	0,70	-	-	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	Max. 9,8	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Kadmium (Cd)	mg/kg	<0,5	Max. 0,99	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	Max. 0,18	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	29	Max. 120	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	5	Max. 32	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	Max. 43	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	<5	Max. 36	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	<3	Max. 23	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
10	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	-	-	UESPA 8440 1996

Description : < = Smaller than
Criteria from ***Wisconsin Department of Natural Resources***

Sample Item : **Sediment (S 4)**
Coordinatee : S 08° 32' 55,2" E 125° 34' 15,3"
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Organic Carbon (TOC)	%	0,79	-	-	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	Max. 9,8	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	2	Max. 0,99	Fail	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	Max. 0,18	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	26	Max. 120	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	7	Max. 32	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	Max. 43	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	<5	Max. 36	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	4	Max. 23	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
10	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	-	-	UESPA 8440 1996

Description : < = Smaller than
*Criteria from **Wisconsin Department of Natural Resources***

Sample Item : **Sediment (S5)**
Coordinate : S 08º 32' 59,3" E 125º 34' 27,7"
Sampling Date : August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
1	Total Organic Carbon (TOC)	%	0,78	-	-	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	Max. 9,8	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	0,5	Max. 0,99	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	Max. 0,18	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	78	Max. 120	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	19	Max. 32	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	Max. 43	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	5	Max. 36	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

NO	PARAMETER	UNIT	RESULT	CRITERIA	EVALUATION	METHOD
9	Nickel (Ni)	mg/kg	4	Max. 23	Pass	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
10	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	-	-	UESPA 8440 1996

Description : < = Smaller than
*Criteria from **Wisconsin Department of Natural Resources***

3.4.3 Noise Level (Code: U)

a. Methodology of Data Collection

Noise level for environmental purpose was measured by sound level meter. The sound pressure dB(A) was measured for 5 minutes for every measurement. Readings were taken for 5 seconds. Measurement was carried out for 24 hours (L_{sm}) at the day during peak activity for 16 hours (L_s) between 06.00 am – 10.00 pm and night activity for 8 hours between 10.00 pm – 06.00 am.

b. Methodology of Data Analysis

Sampling using SNI 7231 2009 method with interval of measurement are as follow:

(1) L1 representing interval 06.00 - 09.00
(2) L2 representing interval 09.00 - 14.00
(3) L3 representing interval 14.00 - 17.00
(4) L4 representing interval 17.00 - 22.00
(5) L5 representing interval 22.00 - 24.00
(6) L6 representing interval 24.00 - 03.00
(7) L7 representing interval 03.00 - 06.00

c. Location

Noise level measurement samplings consist of 3 locations, and they are shown in **Figure 3.2**.

Figure 3.5 Noise Level Sampling Activity

d. Test Result

Noise level measurements result around survey area are shown below.

Table 3.5 Noise Level Sampling Result

Sample Item : **Noise Level (U 1)**
Sampling Method : SNI 7231 : 2009
Coordinate : S 08º 33' 00,2" E 125º 34' 15,2"
Sampling Date : July 29 and 30, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	LOCATION	TIME	RESULT *) L_S dB (A)	CRITERIA dB (A)	EVALUATION
K1	Port Location - West	L1. 07 ^{00} L.2 10 ^{00} L3. 15 ^{00} L4. 20 ^{00}	66	Max. 60	Fail

NO	LOCATION	TIME	RESULT *) L_M dB (A)	CRITERIA dB (A)	EVALUATION
K1	Port Location - West	L5. 23 ^{00} L6. 01 ^{00} L7. 04 ^{00}	50	Max. 60	Pass

NO	LOCATION	TIME	RESULT *) L_{SM} dB (A)	CRITERIA dB (A)	EVALUATION
K1	Port Location - West	L1. 07 ^{00} L.2 10 ^{00} L3. 15 ^{00} L4. 20 ^{00} L5. 23 ^{00} L6. 01 ^{00} L7. 04 ^{00}	64	Max. 60 + 3	Fail
METHOD			**22-3/IK/UA-0**		

*Description: *) = Noise Level is an Equivalent Number along temporary time measurement in 10 minutes with interval 5 seconds.*
***) = Accreditation parameter by KAN No. LP-195-IDN*
*Criteria using **Environmental Decree of Republic Indonesia No. 48 of 1996 for Public Facilities***

- L_S = Leq Value at Daytime (16 hours)
- L_M = Leq Value at Nighttime (8 nours)
- L_{SM} = Leq Value along 24 hours
- L_{SM} value that calculate and compare with noise level standard set with tolerance value +3 dB(A)

Sample Item : **Noise Level (U2)**
Sampling Method : SNI 7231 : 2009
Sampling Date : July 30 and 31, 2015
Recieve Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	LOCATION	TIME	RESULT *) L_S dB (A)	CRITERIA dB (A)	EVALUATION
K2	Port Location - East	L1. 07 ^{00} L.2 10 ^{00} L3. 15 ^{00} L4. 20 ^{00}	58	Max. 60	Pass

NO	LOCATION	TIME	RESULT *) L_M dB (A)	CRITERIA dB (A)	EVALUATION
K2	Port Location - East	L5. 23 ^{00}	49	Max. 60	Pass

NO	LOCATION	TIME	RESULT *) L_M dB (A)	CRITERIA dB (A)	EVALUATION
		L6. 01 ^{00}			
		L7. 04 ^{00}			

NO	LOCATION	TIME	RESULT *) L_{SM} dB (A)	CRITERIA dB (A)	EVALUATION
K2	Port Location - East	L1. 07 ^{00}	57	Max. 60 + 3	Pass
		L.2 10 ^{00}			
		L3. 15 ^{00}			
		L4. 20 ^{00}			
		L5. 23 ^{00}			
		L6. 01 ^{00}			
		L7. 04 ^{00}			
METHOD			**22-3/IK/UA-0**		

*Description: *) = Noise Level is an Equivalent Number along temporary time measurement in 10 minutes with interval 5 seconds.*
***) = Accreditation parameter by KAN No. LP-195-IDN*
*Criteria using **Environmental Decree of Republic Indonesia No. 48 of 1996 for Public Facilities***

- L_S = Leq Value at Daytime (16 hours)
- L_M = Leq Value at Nighttime (8 nours)
- L_{SM} = Leq Value along 24 hours
- L_{SM} value that calculate and compare with noise level standard set with tolerance value +3 dB(A)

Sample Item : **Noise Level (U3)**
Sampling Method : SNI 7231 : 2009
Sampling Date : July 31 and August 01, 2015
Receive Laboratory Date : August 04, 2015
Test Date : August 04, 2015 until August 26, 2015

NO	LOCATION	TIME	RESULT *) L_S dB (A)	CRITERIA dB (A)	EVALUATION
K3	Outside Port	L1. 07 ^{00}	54	Max. 60	Pass
		L.2 10 ^{00}			
		L3. 15 ^{00}			
		L4. 20 ^{00}			

NO	LOCATION	TIME	RESULT *) L_M dB (A)	CRITERIA dB (A)	EVALUATION
K3	Outside Port	L5. 23 ^{00}	43	Max. 60	Pass
		L6. 01 ^{00}			
		L7. 04 ^{00}			

NO	LOCATION	TIME	RESULT *) L_{SM} dB (A)	CRITERIA dB (A)	EVALUATION
K3	Outside Port	L1. 07 ^{00}	53	Max. 60 + 3	Pass
		L.2 10 ^{00}			
		L3. 15 ^{00}			
		L4. 20 ^{00}			
		L5. 23 ^{00}			
		L6. 01 ^{00}			
		L7. 04 ^{00}			
METHOD			**22-3/IK/UA-0**		

*Description: *) = Noise Level is an Equivalent Number along temporary time measurement in 10 minutes with interval 5 seconds.*
***) = Accreditation parameter by KAN No. LP-195-IDN*
*Criteria using **Environmental Decree of Republic Indonesia No. 48 of 1996 for Public Facilities***

- L_S = Leq Value at Daytime (16 hours)
- L_M = Leq Value at Nighttime (8 nours)
- L_{SM} = Leq Value along 24 hours
- L_{SM} value that calculate and compare with noise level standard set with tolerance value +3 dB(A)

3.4.4 Ambient Air Quality (Code: U)

a. Methodology of Data Collection

Taking samples of air quality especially dust (TSP) and Pb were carried out by High Volume Air Sampler, and taking samples for gas air pollutants were carried out by Gas Sampler. Collected, samples were analyzed in laboratory.

b. Methodology of Data Analysis

Sampling was carried out in accordance with SNI 19-71119.6-2005 method.

c. Location

Air quality sampling location consists of 3 locations, and they are shown in **Figure 3.2**.

Figure 3.6 Air Quality Sampling Activity

d. Test Result

Below is test result of ambient air quality in the survey area.

Table 3.6 Ambient Air Quality Sampling Result

Sample Item	:	**Ambient Air Quality** **Location Port - West (U1)**
Sampling Method	:	SNI 19-7119.6-2005
Coordinate	:	S 08º 33' 07,3" E 125º 34' 23,1"
Sampling Date	:	July 29 and 30, 2015
Receive Laboratory Date	:	August 04, 2015
Test Date	:	August 04, 2015 until August 26, 2015
Temperature	:	24 - 34 °C
Humidity	:	62 - 83 % RH
Dominant wind direction	:	West
Wind speed average	:	1.7 km/hour
Weather	:	Bright

NO	PARAMETER	DURATION OF TEST	UNIT	RESULT	INDONESIAN STANDARD	WHO STANDARD	EVALUATION	METHOD
1	Sulphur Dioxide (SO_2) **)	1 Hour	µg/Nm^3	25	Max. 900	-	Pass	SNI 19-7119.7-2005
		24 Hour	µg/Nm^3	-	Max. 365	125 (interim target-1) 50 (interim target-2) 20 (guideline)	-	
2	Carbon Monoxide (CO) **)	1 Hour	µg/Nm^3	3.357	Max. 30.000	-	Pass	SNI 7119.10-2011
		24 Hour	µg/Nm^3	-	Max. 10.000	-	-	
3	Nitrogen Dioxide (NO_2) **)	1 Hour	µg/Nm^3	23	Max. 400	200 (guideline)	Pass	SNI 19.7119.2.2005
		24 Hour	µg/Nm^3	-	Max. 150	-	-	
4	Ozone (O_3) **)	1 Hour	µg/Nm^3	35	Max. 235	-	Pass	SNI 19-7119.8-2005
5	Hydro carbon (HC) **)	3 Hour	µg/Nm^3	105	Max. 160	-	Pass	SNI 7119.13-2009
6	Dust (TSP) **)	24 Hour	µg/Nm^3	120	Max. 230	-	Pass	SNI 19-7119.3-2005
7	PM_{10} (Particulate < 10 µm)	24 Hour	µg/Nm^3	50	Max. 150	150 (interim target-1) 100 (interim target-2) 75 (interim target-3) 50 (guideline)	Pass	High volume air sampler
8	$PM_{2,5}$ (Particulate < 2,5 µm)	24 Hour	µg/Nm^3	28	Max. 65	75 (interim target-1) 50 (interim target-2) 37,5 (interim target-3) 25 (guideline	Pass	High volume air sampler
9	Lead (Pb) **)	24 Hour	µg/Nm^3	0,1	Max. 2	-	Pass	SNI 19-7119.4-2005

Description : *Criteria Standard from **Government Regulation of Republic Indonesia No. 41 of 1999 National Ambient Air Quality Standard** and **WHO IFC Standard***
***) = Parameter Accreditation by KAN No. LP-195-IDN*
N = Dry Air Suction Volume Unit Corrected in Normal Condition (25°C, 76 cmHg)

Sample Item	:	**Ambient Air Quality Location Port - East (U2)**
Sampling Method	:	SNI 19-7119.6-2005
Coordinate	:	S 08° 33' 12,5" E 125° 34' 36,7"
Sampling Date	:	July 30 and 31, 2015
Receive Laboratory Date	:	August 04, 2015
Test Date	:	August 04, 2015 until August 26, 2015
Temperature	:	24 - 34 °C
Humidity	:	62 - 83 % RH
Dominant wind direction	:	West
Wind speed average	:	2.1 km/hour
Weather	:	Bright

NO	PARAMETER	DURATION OF TEST	UNIT	RESULT	INDONESIAN STANDARD	WHO STANDARD	EVALUATION	METHOD
1	Sulphur Dioxide (SO_2) **)	1 Hour	µg/Nm^3	23	Max. 900	-	Pass	SNI 19-7119.7-2005
		24 Hour	µg/Nm^3	-	Max. 365	125 (interim target-1) 50 (interim target-2) 20 (guideline)	-	
2	Carbon	1 Hour	µg/Nm^3	3.299	Max. 30.000	-	Pass	SNI 7119.10-

NO	PARAMETER	DURATION OF TEST	UNIT	RESULT	INDONESIAN STANDARD	WHO STANDARD	EVALUATION	METHOD
	Monoxide (CO) **)	24 Hour	µg/Nm^3	-	Max. 10.000	-	-	2011
3	Nitrogen Dioxide (NO_2) **)	1 Hour	µg/Nm^3	21	Max. 400	200 (guideline)	Pass	SNI 19.7119.2.2005
		24 Hour	µg/Nm^3	-	Max. 150	-	-	
4	Ozone (O_3) **)	1 Hour	µg/Nm^3	34	Max. 235	-	Pass	SNI 19-7119.8-2005
5	Hydro carbon (HC) **)	3 Hour	µg/Nm^3	98	Max. 160	-	Pass	SNI 7119.13-2009
6	Dust (TSP) **)	24 Hour	µg/Nm^3	110	Max. 230	-	Pass	SNI 19-7119.3-2005
7	PM_{10} (Particulate < 10 µm)	24 Hour	µg/Nm^3	40	Max. 150	150 (interim target-1) 100 (interim target-2) 75 (interim target-3) 50 (guideline)	Pass	High volume air sampler
8	$PM_{2,5}$ (Particulate < 2,5 µm)	24 Hour	µg/Nm^3	22	Max. 65	75 (interim target-1) 50 (interim target-2) 37,5 (interim target-3) 25 (guideline	Pass	High volume air sampler
9	Lead (Pb) **)	24 Hour	µg/Nm^3	0,05	Max. 2	-	Pass	SNI 19-7119.4-2005

Description : *Criteria Standard from **Government Regulation of Republic Indonesia No. 41 of 1999 National Ambient Air Quality Standard** and **WHO IFC Standard***
***) = Parameter Accreditation by KAN No. LP-195-IDN*
N = Dry Air Suction Volume Unit Corrected in Normal Condition (25°C, 76 cmHg)

Sample Item	:	**Ambient Air Quality Outside Port Location (U3)**
Sampling Method	:	SNI 19-7119.6-2005
Coordinate	:	S 08° 33' 00,2" E 125° 34' 15,2"
Sampling Date	:	July 31, 2015 until August 1, 2015
Receive Laboratory Date	:	August 04, 2015
Test Date	:	August 04, 2015 until August 26, 2015
Temperature	:	24 - 34 °C
Humidity	:	62 - 85 % RH
Dominant wind direction	:	West
Wind speed average	:	2.8 km/hour
Weather	:	Bright

NO	PARAMETER	DURATION OF TEST	UNIT	RESULT	INDONESIAN STANDARD	WHO STANDARD	EVALUATION	METHOD
1	Sulphur Dioxide (SO_2) **)	1 Hour	µg/Nm^3	15	Max. 900	-	Pass	SNI 19-7119.7-2005
		24 Hour	µg/Nm^3	-	Max. 365	125 (interim target-1) 50 (interim target-2) 20 (guideline)	-	
2	Carbon Monoxide (CO) **)	1 Hour	µg/Nm^3	2.795	Max. 30.000	-	Pass	SNI 7119.10-2011
		24 Hour	µg/Nm^3	-	Max. 10.000	-	-	
3	Nitrogen Dioxide (NO_2) **)	1 Hour	µg/Nm^3	14	Max. 400	200 (guideline)	Pass	SNI 19.7119.2.2005
		24 Hour	µg/Nm^3	-	Max. 150	-	-	
4	Ozone (O_3) **)	1 Hour	µg/Nm^3	34	Max. 235	-	Pass	SNI 19-7119.8-2005
5	Hydro carbon (HC) **)	3 Hour	µg/Nm^3	85	Max. 160	-	Pass	SNI 7119.13-2009

NO	PARAMETER	DURATION OF TEST	UNIT	RESULT	INDONESIAN STANDARD	WHO STANDARD	EVALUATION	METHOD
6	Dust (TSP) **)	24 Hour	µg/Nm^3	67	Max. 230	-	Pass	SNI 19-7119.3-2005
7	PM_{10} (Particulate < 10 µm)	24 Hour	µg/Nm^3	29	Max. 150	150 (interim target-1) 100 (interim target-2) 75 (interim target-3) 50 (guideline)	Pass	High volume air sampler
8	$PM_{2,5}$ (Particulate < 2,5 µm)	24 Hour	µg/Nm^3	13	Max. 65	75 (interim target-1) 50 (interim target-2) 37,5 (interim target-3) 25 (guideline	Pass	High volume air sampler
9	Lead (Pb) **)	24 Hour	µg/Nm^3	<0,02	Max. 2	-	Pass	SNI 19-7119.4-2005

Description : *Criteria Standard from **Government Regulation of Republic Indonesia No. 41 of 1999 National Ambient Air Quality Standard** and **WHO IFC Standard***
***) = Parameter Accreditation by KAN No. LP-195-IDN*
N = Dry Air Suction Volume Unit Corrected in Normal Condition (25°C, 76 cmHg)

3.5 LABORATORY TESTING RESULT

Laboratory analysis has been carried out in the Unilab laboratory, Jakarta, Indonesia and the results are attached in the annex.

Table 3.7 Checklist of Sample and Results

SAMPLE (NAME/CODE)	LOCATION	NUMBER
(1) Ambient Air Quality (U)	U1, U2, U3	3
(2) Noise Level (U)	U1, U2, U3	3
(3) Water Quality (AL)	AL1, AL2, AL3, AL4, AL5	5
(4) Sediment Quality (S)	S1, S2, S3, S4, S5	5
(5) Plankton (P)	P1, P2, P3	3

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KAN
Komite Akreditasi Nasional
Laboratorium Penguji
LP-195-IDN

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Kantor Perwakilan : Jl. Kutisari IV/2B, Kutisari, Tenggilis Mejoyo, Surabaya, Jawa Timur, Telp. (031) 8415839 Fax : (031) 8415839

REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-01/UA/08/2015
Description of Sample	: **Ambient Air** **U1. Location Port - West**
Coordinate	: S 08° 33' 07,3" E 125° 34' 23,1"
Method of sampling	: SNI 19-7119.6-2005
Date of sampling	: July 29 - 30, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Result of Measurement

Temperature	: 24 - 34	°C
Humidity	: 62 - 83	% RH
Wind direction from	: West	
Wind Velocity	: 1,7	km/hour
Climate	: Bright	

Laboratory Analysis Result

NO.	PARAMETER	TIME OF MEASUREMENT	REQUIREMENT *)	UNIT	RESULT	METHOD
1	Sulfur Dioxide (SO_2) **)	1 hour	900	µg/Nm^3	25	SNI 19-7119.7-2005
		24 hours	365	µg/Nm^3	-	
2	Carbon Monoxide (CO) **)	1 hour	30,000	µg/Nm^3	3.357	SNI 7119.10-2011
		24 hours	10,000	µg/Nm^3	-	
3	Nitrogen Dioxide (NO_2) **)	1 hour	400	µg/Nm^3	23	SNI 19.7119.2.2005
		24 hours	150	µg/Nm^3	-	
4	Oxidant (Ox) **)	1 hour	235	µg/Nm^3	35	SNI 19-7119.8-2005
5	Hydrocarbon (HC) **)	3 hours	160	µg/Nm^3	105	SNI 7119.13-2009
6	Dust (TSP) **)	24 hours	230	µg/Nm^3	120	SNI 19-7119.3-2005
7	PM_{10} (Dust < 10 µm)	24 hours	150	µg/Nm^3	50	High volume air sampler
8	$PM_{2.5}$ (Dust < 2,5 µm)	24 hours	65	µg/Nm^3	28	High volume air sampler
9	Lead (Pb) **)	24 hours	2	µg/Nm^3	0,1	SNI 19-7119.4-2005

Note : *) = **PPRI No. 41 year 1999 – National Ambient Air Quality Standards**
**) = Accredited Parameter by National Accreditation Commitee (KAN) No. LP-195-IDN
N = Unit of Absorb Volume Dry Air corrected by Normal Condition (25°C, 76 cmHg)

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khaitun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
LABORATORIUM LINGKUNGAN HIDUP
No. Reg. : 0001/LPJ/LABLING-1/LRK/KLH

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-02/UA/08/2015
Description of Sample	: **Ambient Air U2. Location Port - East**
Coordinate	: S 08° 33' 12,5" E 125° 34' 36,7"
Method of sampling	: SNI 19-7119.6-2005
Date of sampling	: July 30 - 31, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Result of Measurement

Temperature	: 24 - 34	°C
Humidity	: 62 - 83	% RH
Wind direction from	: West	
Wind Velocity	: 2,1	km/hour
Climate	: Bright	

Laboratory Analysis Result

NO.	PARAMETER	TIME OF MEASUREMENT	REQUIREMENT *)	UNIT	RESULT	METHOD
1	Sulfur Dioxide (SO_2) **)	1 hour	900	µg/Nm^3	23	SNI 19-7119.7-2005
		24 hours	365	µg/Nm^3	-	
2	Carbon Monoxide (CO) **)	1 hour	30,000	µg/Nm^3	3.299	SNI 7119.10-2011
		24 hours	10,000	µg/Nm^3	-	
3	Nitrogen Dioxide (NO_2) **)	1 hour	400	µg/Nm^3	21	SNI 19.7119.2.2005
		24 hours	150	µg/Nm^3	-	
4	Oxidant (Ox) **)	1 hour	235	µg/Nm^3	34	SNI 19-7119.8-2005
5	Hydrocarbon (HC) **)	3 hours	160	µg/Nm^3	98	SNI 7119.13-2009
6	Dust (TSP) **)	24 hours	230	µg/Nm^3	110	SNI 19-7119.3-2005
7	PM_{10} (Dust < 10 µm)	24 hours	150	µg/Nm^3	40	High volume air sampler
8	$PM_{2,5}$ (Dust < 2,5 µm)	24 hours	65	µg/Nm^3	22	High volume air sampler
9	Lead (Pb) **)	24 hours	2	µg/Nm^3	0,05	SNI 19-7119.4-2005

Note : *) = **PPRI No. 41 year 1999 – National Ambient Air Quality Standards**
**) = Accredited Parameter by National Accreditation Commitee (KAN) No. LP-195-IDN
N = Unit of Absorb Volume Dry Air corrected by Normal Condition (25°C, 76 cmHg)

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
LABORATORIUM LINGKUNGAN HIDUP
No. Reg. : 0001/LPJ/LABLING-1/LRK/KLH

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-03/UA/08/2015
Description of Sample	: **Ambient Air** **U3. Outside Port Location**
Coordinate	: S 08° 33' 00,2" E 125° 34' 15,2"
Method of sampling	: SNI 19-7119.6-2005
Date of sampling	: July 31 - August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Result of Measurement

Temperature	: 24 - 34	°C
Humidity	: 62 - 83	% RH
Wind direction from	: West	
Wind Velocity	: 2,1	km/hour
Climate	: Bright	

Laboratory Analysis Result

NO.	PARAMETER	TIME OF MEASUREMENT	REQUIREMENT *)	UNIT	RESULT	METHOD
1	Sulfur Dioxide (SO_2) **)	1 hour	900	µg/Nm^3	15	SNI 19-7119.7-2005
		24 hours	365	µg/Nm^3	-	
2	Carbon Monoxide (CO) **)	1 hour	30,000	µg/Nm^3	2.795	SNI 7119.10-2011
		24 hours	10,000	µg/Nm^3	-	
3	Nitrogen Dioxide (NO_2) **)	1 hour	400	µg/Nm^3	14	SNI 19.7119.2.2005
		24 hours	150	µg/Nm^3	-	
4	Oxidant (Ox) **)	1 hour	235	µg/Nm^3	34	SNI 19-7119.8-2005
5	Hydrocarbon (HC) **)	3 hours	160	µg/Nm^3	85	SNI 7119.13-2009
6	Dust (TSP) **)	24 hours	230	µg/Nm^3	67	SNI 19-7119.3-2005
7	PM_{10} (Dust < 10 µm)	24 hours	150	µg/Nm^3	29	High volume air sampler
8	$PM_{2,5}$ (Dust < 2,5 µm)	24 hours	65	µg/Nm^3	13	High volume air sampler
9	Lead (Pb) **)	24 hours	2	µg/Nm^3	<0,02	SNI 19-7119.4-2005

Note : *) = **PPRI No. 41 year 1999 – National Ambient Air Quality Standards**
**) = Accredited Parameter by National Accreditation Commitee (KAN) No. LP-195-IDN
N = Unit of Absorb Volume Dry Air corrected by Normal Condition (25°C, 76 cmHg)

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
LABORATORIUM LINGKUNGAN HIDUP
No. Reg. : 0001/LPJ/LABLING-1/LRK/KLH

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE
Address	: Dili, Timor Leste
Identification number	: 05958-04/K/08/2015
Uraian contoh	: **Noise (24 Hours) **)**
Method of sampling	: SNI 7231 : 2009
Date of sampling	: July 29 - 30, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_S dB (A)
K1	Location Port - West S 08° 33' 07,3" E 125° 34' 23,1"	L1. 07 ^{00}	66
		L.2 10 ^{00}	
		L3. 15 ^{00}	
		L4. 20 ^{00}	

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_M dB (A)
K1	Location Port - West S 08° 33' 07,3" E 125° 34' 23,1"	L5. 23 ^{00}	50
		L6. 01 ^{00}	
		L7. 04 ^{00}	

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_{SM} dB (A)
K1	Location Port - West S 08° 33' 07,3" E 125° 34' 23,1"	L1. 07 ^{00}	64
		L.2 10 ^{00}	
		L3. 15 ^{00}	
		L4. 20 ^{00}	
		L5. 23 ^{00}	
		L6. 01 ^{00}	
		L7. 04 ^{00}	
	METHOD		22-3/IK/UA-0

Note : *) = Noise value is the value of equivalent noise during the measurement time is for 10 minutes with intervals of 5 seconds.
**) = Accredited Parameter by KAN No. LP-196-IDN.

- L_S = Leq Value (Daytime) (16 hours)
- L_M = Leq Value (Night) (8 hours)
- L_{SM} = Leq Value for 24 hours
- L_{SM} Value calculated compared with standard values of Noise level Set with Tolerance + 3 dB(A)

- KEP. 48/MENLH/11/1996, Attachement I Standard for Noise Level for 24 hours

1. Governance and Public Facilities = 60 dB (A)
2. Office and Commercial Area = 65 dB (A)
3. Housing and Settlements = 55 dB (A)
4. Trade and Services = 70 dB (A)
5. Green open space = 50 dB (A)
6. Recreation = 70 dB (A)
7. Industry = 70 dB (A)

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
LABORATORIUM LINGKUNGAN HIDUP
No. Reg. : 0001/LPJ/LABLING-1/LRK/KLH

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE
Address	: Dili, Timor Leste
Identification number	: 05958-05/K/08/2015
Uraian contoh	: **Noise (24 Hours) **)**
Method of sampling	: SNI 7231 : 2009
Date of sampling	: July 30 - 31, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_S dB (A)
K1	Location Port - East S 08° 33' 12,5" E 125° 34' 36,7"	L1. 07 ^{00}	58
		L.2 10 ^{00}	
		L3. 15 ^{00}	
		L4. 20 ^{00}	

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_M dB (A)
K1	Location Port - East S 08° 33' 12,5" E 125° 34' 36,7"	L5. 23 ^{00}	49
		L6. 01 ^{00}	
		L7. 04 ^{00}	

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_{SM} dB (A)
K1	Location Port - East S 08° 33' 12,5" E 125° 34' 36,7"	L1. 07 ^{00}	57
		L.2 10 ^{00}	
		L3. 15 ^{00}	
		L4. 20 ^{00}	
		L5. 23 ^{00}	
		L6. 01 ^{00}	
		L7. 04 ^{00}	
METHOD			22-3/IK/UA-0

Note : *) = Noise value is the value of equivalent noise during the measurement time is for 10 minutes with intervals of 5 seconds.
**) = Accredited Parameter by KAN No. LP-195-IDN.

- L_S = Leq Value (Daytime) (16 hours)
- L_M = Leq Value (Night) (8 hours)
- L_{SM} = Leq Value for 24 hours
- L_{SM} Value calculated compared with standard values of Noise level Set with Tolerance + 3 dB(A)

- KEP. 48/MENLH/11/1996, Attachement I Standard for Noise Level for 24 hours

1. Governance and Public Facilities = 60 dB (A)
2. Office and Commercial Area = 65 dB (A)
3. Housing and Settlements = 55 dB (A)
4. Trade and Services = 70 dB (A)
5. Green open space = 50 dB (A)
6. Recreation = 70 dB (A)
7. Industry = 70 dB (A)

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
LABORATORIUM LINGKUNGAN HIDUP
No. Reg. : 0001/LPJ/LABLING-1/LRK/KLH

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-06/K/08/2015
Uraian contoh	: **Noise (24 Hours) **)**
Method of sampling	: SNI 7231 : 2009
Date of sampling	: July 31 - August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_S dB (A)
K1	Outside Port Location S 08° 33' 00,2" E 125° 34' 15,2"	L1. 07 ^{00}	54
		L.2 10 ^{00}	
		L3. 15 ^{00}	
		L4. 20 ^{00}	

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_M dB (A)
K1	Outside Port Location S 08° 33' 00,2" E 125° 34' 15,2"	L5. 23 ^{00}	43
		L6. 01 ^{00}	
		L7. 04 ^{00}	

NO.	LOCATION	TIME OF SAMPLING	RESULT *) L_{SM} dB (A)
K1	Outside Port Location S 08° 33' 00,2" E 125° 34' 15,2"	L1. 07 ^{00}	53
		L.2 10 ^{00}	
		L3. 15 ^{00}	
		L4. 20 ^{00}	
		L5. 23 ^{00}	
		L6. 01 ^{00}	
		L7. 04 ^{00}	
	METHOD		22-3/IK/UA-0

Note : *) = Noise value is the value of equivalent noise during the measurement time is for 10 minutes with intervals of 5 seconds.
**) = Accredited Parameter by KAN No. LP-195-IDN.

- L_S = Leq Value (Daytime) (16 hours)
- L_M = Leq Value (Night) (8 hours)
- **L_{SM} = Leq Value for 24 hours**
- L_{SM} Value calculated compared with standard values of Noise level Set with Tolerance + 3 dB(A)

• KEP. 48/MENLH/11/1996, Attachement I Standard for Noise Level for 24 hours

1. Governance and Public Facilities = 60 dB (A)
2. Office and Commercial Area = 65 dB (A)
3. Housing and Settlements = 55 dB (A)
4. Trade and Services = 70 dB (A)
5. Green open space = 50 dB (A)
6. Recreation = 70 dB (A)
7. Industry = 70 dB (A)

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-07/AL/08/2015
Description of Sample	: **Sea Water (AL 1)**
Coordinate	: S 08° 33' 11,3" E 125° 34' 36,1"
Method of sampling	: SNI 06-2412-1991
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Phosphate (PO_4) *)	mg/L	0,02	18-27/IK/ALT
2	Salinity	‰	39	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Ekstraksi-Spektrofotometri
4	Turbidity	NTU	1	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) on site	mg/L	3	SNI 06-6989.14-2004
6	pH (on site) *)	-	8	SNI 06-6989.11-2004
7	Temperature (on site) *)	°C	29	SNI 06-6989.23-2005
8	Total coliform	MPN/100ml	3	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solid (TSS) *)	mg/L	<2	SNI 06-6989.3-2004
10	COD	mg/L	45	SNI 06-6989.15-2004
11	Nitrogen (N) Total	mg/L	2	Metode Penelitian Air Bab XI -1984
12	Total Disolved Solid (TDS)	mg/L	38.300	SNI 06-6989.27-2005

Description : *) = Parameter Accreditation by KAN No. LP-195-IDN
< = Smaller than

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
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PT. UNILAB PERDANA
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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-08/AL/08/2015
Description of Sample	: **Sea Water (AL 2)**
Coordinate	: S 08° 33' 09,6" E 125° 34' 28,5"
Method of sampling	: SNI 06-2412-1991
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Phosphate (PO_4) *)	mg/L	<0,01	18-27/IK/ALT
2	Salinity	‰	38	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Ekstraksi-Spektrofotometri
4	Turbidity	NTU	2	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) on site	mg/L	3	SNI 06-6989.14-2004
6	pH (on site) *)	-	8	SNI 06-6989.11-2004
7	Temperature (on site) *)	°C	29	SNI 06-6989.23-2005
8	Total coliform	MPN/100ml	4	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solid (TSS) *)	mg/L	<2	SNI 06-6989.3-2004
10	COD	mg/L	46	SNI 06-6989.15-2004
11	Nitrogen (N) Total	mg/L	5	Metode Penelitian Air Bab XI -1984
12	Total Disolved Solid (TDS)	mg/L	39.200	SNI 06-6989.27-2005

Description : *) = Parameter Accreditation by KAN No. LP-185-IDN
< = Smaller than

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

LABORATORIUM KONSULTANSI LINGKUNGAN HIDUP

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
LABORATORIUM LINGKUNGAN HIDUP

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-09/AL/08/2015
Description of Sample	: **Sea Water (AL 3)**
Coordinate	: S 08° 33' 03,5" E 125° 34' 23,7"
Method of sampling	: SNI 06-2412-1991
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Phosphate (PO_4) *)	mg/L	0,01	18-27/IK/ALT
2	Salinity	‰	38	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Ekstraksi-Spektrofotometri
4	Turbidity	NTU	1	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) on site	mg/L	3	SNI 06-6989.14-2004
6	pH (on site) *)	-	8	SNI 06-6989.11-2004
7	Temperature (on site) *)	°C	30	SNI 06-6989.23-2005
8	Total coliform	MPN/100ml	4	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solid (TSS) *)	mg/L	<2	SNI 06-6989.3-2004
10	COD	mg/L	40	SNI 6989.2-2009
11	Nitrogen (N) Total	mg/L	2	Metode Penelitian Air Bab XI -1984
12	Total Disolved Solid (TDS)	mg/L	38.300	SNI 06-6989.27-2005

Description : *) = Parameter Accreditation by KAN No. LP-195-IDN
< = Smaller than

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-10/AL/08/2015
Description of Sample	: **Sea Water (AL 4)**
Coordinate	: S 08° 32' 55,2" E 125° 34' 15,3"
Method of sampling	: SNI 06-2412-1991
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Phosphate (PO_4) *)	mg/L	0,01	18-27/IK/ALT
2	Salinity	‰	39	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Ekstraksi-Spektrofotometri
4	Turbidity	NTU	3	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) on site	mg/L	4	SNI 06-6989.14-2004
6	pH (on site) *)	-	8	SNI 06-6989.11-2004
7	Temperature (on site) *)	°C	29	SNI 06-6989.23-2005
8	Total coliform	MPN/100ml	3	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solid (TSS) *)	mg/L	<2	SNI 06-6989.3-2004
10	COD	mg/L	34	SNI 6989.2-2009
11	Nitrogen (N) Total	mg/L	2	Metode Penelitian Air Bab XI -1984
12	Total Disolved Solid (TDS)	mg/L	38.900	SNI 06-6989.27-2005

Description : *) = Parameter Accreditation by KAN No. LP-195-IDN
< = Smaller than

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-11/AL/08/2015
Description of Sample	: **Sea Water (AL 5)**
Coordinate	: S 08° 32' 59,3" E 125° 34' 27,7"
Method of sampling	: SNI 06-2412-1991
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Phosphate (PO_4) *)	mg/L	<0,01	18-27/IK/ALT
2	Salinity	‰	39	APHA Ed. 22nd 2520.B-2012
3	Oil & Grease	mg/L	<0,2	Ekstraksi-Spektrofotometri
4	Turbidity	NTU	2	SNI 06-6989.25-2005
5	Dissolved Oxygen (DO) on site	mg/L	4	SNI 06-6989.14-2004
6	pH (on site) *)	-	8	SNI 06-6989.11-2004
7	Temperature (on site) *)	°C	29	SNI 06-6989.23-2005
8	Total coliform	MPN/100ml	<3	APHA Ed. 22nd 9221.B-2012
9	Total Suspended Solid (TSS) *)	mg/L	<2	SNI 06-6989.3-2004
10	COD	mg/L	26	SNI 6989.2-2009
11	Nitrogen (N) Total	mg/L	2	Metode Penelitian Air Bab XI -1984
12	Total Disolved Solid (TDS)	mg/L	39.400	SNI 06-6989.27-2005

Description : *) = Parameter Accreditation by KAN No. LP-195-IDN
< = Smaller than

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-12/SD/08/2015
Description of Sample	: **Sediment (Sediment 1)**
Coordinate	: S 08° 33' 11,3" E 125° 34' 36,1"
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Organik Carbon (TOC)	%	0,85	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	21	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	<5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

Note : < = Smaller than

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-13/SD/08/2015
Description of Sample	: **Sediment (Sediment 2)**
Coordinate	: S 08° 33' 09,6" E 125° 34' 28,5"
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Organik Carbon (TOC)	%	0,79	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	143	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	20	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	8	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-14/SD/08/2015
Description of Sample	: **Sediment (Sediment 3)**
Coordinate	: S 08° 33' 03,5" E 125° 34' 23,7"
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	. August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Organik Carbon (TOC)	%	0,70	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	29	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	<5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

Note : < = Smaller than

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-15/SD/08/2015
Description of Sample	: **Sediment (Sediment 4)**
Coordinate	: S 08° 32' 55,2" E 125° 34' 15,3"
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Organik Carbon (TOC)	%	0,79	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	2	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	26	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	7	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	<5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	4	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

Note : < = Smaller than

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-16/SD/08/2015
Description of Sample	: **Sediment (Sediment 5)**
Coordinate	: S 08° 32' 59,3" E 125° 34' 27,7"
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Organik Carbon (TOC)	%	0,78	SNI 13-4720-1998
2	Arsenic (As)	mg/kg	<0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3114B-2012
3	Cadmium (Cd)	mg/kg	0,5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
4	Mercury (Hg)	mg/kg	<0,01	USEPA SW 846-3050B ; APHA Ed 22nd 3112B-2012
5	Zinc (Zn)	mg/kg	78	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
6	Copper (Cu)	mg/kg	19	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
7	Chromium (Cr)	mg/kg	<3	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
8	Lead (Pb)	mg/kg	5	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012
9	Nickel (Ni)	mg/kg	4	USEPA SW 846-3050B ; APHA Ed 22nd 3111B-2012

Note : < = Smaller than

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-17/SD/08/2015
Description of Sample	: **Sediment (Sediment 1)**
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	UESPA 8440 1996
2	TBT (Tri Butil Toluene)	mg/kg	<0,5	Water Leach, LC-MS/MS
3	Water Content	%	9,48	Metoda Gravimetri
4	Texture			
	- Sand Fraction			
	a. > 1000 u	gram	98,21	Metoda Dry Sieve Sievieng
	b. 500 - 1000 u	gram	78,18	Metoda Dry Sieve Sievieng
	c. 200 - 500 u	gram	67,34	Metoda Dry Sieve Sievieng
	d. 100 - 200 u	gram	42,81	Metoda Dry Sieve Sievieng
	e. 50 - 100 u	gram	33,12	Metoda Dry Sieve Sievieng
	- Dust Fraction			
	a. 20 - 50 u	gram	27,34	Metoda Dry Sieve Sievieng
	b. 10 - 20 u	gram	18,41	Metoda Dry Sieve Sievieng
	c. 2 - 10 u	gram	15,10	Metoda Dry Sieve Sievieng
	- Clay Fraction			
	a. 0,05 - 2 u	gram	3,61	Metoda Dry Sieve Sievieng
	b. 0 - 0,05 u	gram	1,71	Metoda Dry Sieve Sievieng

Note : < = Below

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-18/SD/08/2015
Description of Sample	: **Sediment (Sediment 2)**
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	UESPA 8440 1996
2	TBT (Tri Butil Toluene)	mg/kg	<0,5	Water Leach, LC-MS/MS
3	Water Content	%	13,5	Metoda Gravimetri
4	Texture			
	- Sand Fraction			
	a. > 1000 u	gram	73,19	Metoda Dry Sieve Sievieng
	b. 500 - 1000 u	gram	63,25	Metoda Dry Sieve Sievieng
	c. 200 - 500 u	gram	47,23	Metoda Dry Sieve Sievieng
	d. 100 - 200 u	gram	38,72	Metoda Dry Sieve Sievieng
	e. 50 - 100 u	gram	23,44	Metoda Dry Sieve Sievieng
	- Dust Fraction			
	a. 20 - 50 u	gram	19,42	Metoda Dry Sieve Sievieng
	b. 10 - 20 u	gram	12,01	Metoda Dry Sieve Sievieng
	c. 2 - 10 u	gram	8,42	Metoda Dry Sieve Sievieng
	- Clay Fraction			
	a. 0,05 - 2 u	gram	2,11	Metoda Dry Sieve Sievieng
	b. 0 - 0,05 u	gram	1,05	Metoda Dry Sieve Sievieng

Note : < = Below

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-19/SD/08/2015
Description of Sample	: **Sediment (Sediment 3)**
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	UESPA 8440 1996
2	TBT (Tri Butil Toluene)	mg/kg	<0,5	Water Leach, LC-MS/MS
3	Water Content	%	11,2	Metoda Gravimetri
4	Texture			
	- Sand Fraction			
	a. > 1000 u	gram	143,13	Metoda Dry Sieve Sievieng
	b. 500 - 1000 u	gram	82,14	Metoda Dry Sieve Sievieng
	c. 200 - 500 u	gram	49,78	Metoda Dry Sieve Sievieng
	d. 100 - 200 u	gram	29,33	Metoda Dry Sieve Sievieng
	e. 50 - 100 u	gram	17,82	Metoda Dry Sieve Sievieng
	- Dust Fraction			
	a. 20 - 50 u	gram	15,97	Metoda Dry Sieve Sievieng
	b. 10 - 20 u	gram	14,14	Metoda Dry Sieve Sievieng
	c. 2 - 10 u	gram	5,62	Metoda Dry Sieve Sievieng
	- Clay Fraction			
	a. 0,05 - 2 u	gram	1,23	Metoda Dry Sieve Sievieng
	b. 0 - 0,05 u	gram	0,83	Metoda Dry Sieve Sievieng

Note : < = Below

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal : **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address : Dili, Timor Leste
Identification number : 05958-20/SD/08/2015
Description of Sample : **Sediment (Sediment 4)**
Date of sampling : August 01, 2015
Date of received : August 04, 2015
Date of analysis : August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	UESPA 8440 1996
2	TBT (Tri Butil Toluene)	mg/kg	<0,5	Water Leach, LC-MS/MS
3	Water Content	%	14,3	Metoda Gravimetri
4	Texture			
	- Sand Fraction			
	a. > 1000 u	gram	127,27	Metoda Dry Sieve Sievieng
	b. 500 - 1000 u	gram	95,62	Metoda Dry Sieve Sievieng
	c. 200 - 500 u	gram	52,31	Metoda Dry Sieve Sievieng
	d. 100 - 200 u	gram	25,33	Metoda Dry Sieve Sievieng
	e. 50 - 100 u	gram	19,42	Metoda Dry Sieve Sievieng
	- Dust Fraction			
	a. 20 - 50 u	gram	17,43	Metoda Dry Sieve Sievieng
	b. 10 - 20 u	gram	12,24	Metoda Dry Sieve Sievieng
	c. 2 - 10 u	gram	4,31	Metoda Dry Sieve Sievieng
	- Clay Fraction			
	a. 0,05 - 2 u	gram	1,43	Metoda Dry Sieve Sievieng
	b. 0 - 0,05 u	gram	0,72	Metoda Dry Sieve Sievieng

Note : < = Below

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958-21/SD/08/2015
Description of Sample	: **Sediment (Sediment 5)**
Date of sampling	: August 01, 2015
Date of received	: August 04, 2015
Date of analysis	: August 04, 2015 up to August 26, 2015

Laboratory Analysis Result

NO	PARAMETER	UNIT	RESULT	METHOD
1	Total Petroleum Hydrocarbon (TPH)	mg/kg	<20	UESPA 8440 1996
2	TBT (Tri Butil Toluene)	mg/kg	<0,5	Water Leach, LC-MS/MS
3	Water Content	%	16,8	Metoda Gravimetri
4	Texture			
	- Sand Fraction			
	a. > 1000 u	gram	164,20	Metoda Dry Sieve Sievieng
	b. 500 - 1000 u	gram	88,72	Metoda Dry Sieve Sievieng
	c. 200 - 500 u	gram	79,41	Metoda Dry Sieve Sievieng
	d. 100 - 200 u	gram	54,27	Metoda Dry Sieve Sievieng
	e. 50 - 100 u	gram	41,82	Metoda Dry Sieve Sievieng
	- Dust Fraction			
	a. 20 - 50 u	gram	21,92	Metoda Dry Sieve Sievieng
	b. 10 - 20 u	gram	19,33	Metoda Dry Sieve Sievieng
	c. 2 - 10 u	gram	14,55	Metoda Dry Sieve Sievieng
	- Clay Fraction			
	a. 0,05 - 2 u	gram	1,54	Metoda Dry Sieve Sievieng
	b. 0 - 0,05 u	gram	0,91	Metoda Dry Sieve Sievieng

Note : < = Below

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

Khairun Nisa
Quality Assurance Manager

PT. UNILAB PERDANA
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Kantor Perwakilan : Jl. Kutisari IV/2B, Kutisari, Tenggilis Mejoyo, Surabaya, Jawa Timur, Telp. (031) 8415839 Fax : (031) 8415839

REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal	: **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address	: Dili, Timor Leste
Identification number	: 05958.22-24/P/08/2015
Description of sample	: ***Plankton*** **P1. Sea Water AL 3 (S 08° 33' 03,5" E 125° 34' 23,7")** **P2. Between AL3 - AL4 (S 08° 32' 57,0" E 125° 34' 18,0")** **P3. Sea Water AL 4 (S 08° 32' 55,2" E 125° 34' 15,3")**
Method of sampling	: SNI 13-4717-1998
Method of analysis	: SNI 06-3963-1995
Date of sampling	: August 01, 2015
Date of received	: August 01, 2015
Date of analysis	: August 01, 2015 up to August 26, 2015

Fitoplankton :

NO	INDIVIDU	P1	P2	P3
	CYANOPHYTA			
1	*Oscillatoria sp.1*	42525	18711	26649
2	*Oscillatoria sp.2*		19845	5103
	CHRYSOPHYTA			
3	*Amphiprora sp.*		1134	567
4	*Bacteriastrum sp.*	7938	4536	6804
5	*Biddulphia sp.*	7371	3969	10773
6	*Ceratailina sp.*			7938
7	*Chaetoceros laeve*	8505	7371	11907
8	*Chaetoceros sp.1*	21546	16443	27783
9	*Chaetoceros sp.2*	20412	15876	31752
10	*Chaetoceros sp.3*	19278	14742	30618
11	*Chaetoceros sp.4*	14175	15876	11340
12	*Chaetoceros sp.5*		2835	
13	*Climacospenia sp.*	3402	1701	2835
14	*Coscinodiscus jonesianus*	16443	10206	17577
15	*Coscinodiscus sp.1*	17577	10206	8505
16	*Coscinodiscus sp.2*	27216	15876	28917
17	*Coscinodiscus sp.3*		1701	
18	*Fragillaria sp.1*	6804	2268	18711
19	*Fragillaria sp.2*	6804	10773	18711
20	*Hemidiscus sp.*	6237	2835	2268
21	*Licmophora sp.*	3969	1701	1134
22	*Navicula sp.1*		1701	3402
23	*Navicula sp.2*	10206	16443	21546
24	*Nitzschia seriata*	11907	9639	15876
25	*Nitzschia sp.1*	10206	6804	14742
26	*Nitzschia sp.2*	2268	1134	2268
27	*Planktoniella sp.*	2268	1134	567
28	*Pleurosigma sp.1*	2268	1134	7938
29	*Pleurosigma sp.2*	18711	13608	10206
30	*Pleurosigma sp.3*	2268	2835	6804

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Fitoplankton :

NO	INDIVIDU	P1	P2	P3
31	*Rhabdonema sp.*	1701	5103	10206
32	*Rhizosolenia calcar-avis*	29484	19278	43092
33	*Rhizosolenia robusta*	14742	27783	42525
34	*Rhizosolenia styliformis 1*	31752	20979	42525
35	*Rhizosolenia styliformis 2*	2835	2835	1701
36	*Rhizosolenia sp.1*	28350	21546	23814
37	*Rhizosolenia sp.2*	30618	17577	26082
38	*Surirella gemma*		567	1701
39	*Thalassiosira sp.*		3969	1134
40	*Thallasiothrix elongata*	27783	23247	38556
41	*Thallasiothrix nitzschioides*	31752	15876	19845
42	FRAGILARIOIDEAE	3969	1701	1134
Jumlah Individu/m^3		493290	393498	605656
Jumlah Taxa		34	41	40
Indeks diversitas H' = - E pi Ln pi		3.23	3.36	3.32
(SHANNON - WEAVER, 1949)				
H-max = Ln S		3.53	3.71	3.69
Equitailitas (E) = H'/H-max		0.92	0.90	0.90

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Zooplankton :

NO	INDIVIDU	P1	P2	P3
	ARTRHOPODA			
	CRUSTACEA			
	COPEPODA			
1	*Centrophagus sp.*	2835	1134	
2	*Corycaeus sp.*	2268	1134	1701
3	*Microsetella sp.*	1134	7371	4536
4	Oithona sp.1	1701	1134	2835
5	Oithona sp.2	1701		
6	Oncaea sp.	3969	2835	1701
7	COPEPODA (1, nauplius)	1134	1701	1701
8	COPEPODA (2, nauplius)	2268	4536	3402
9	COPEPODA (1, copepodite)	3402	2268	1701
10	COPEPODA (2, copepodite)	567		2835
	PROTOZOA			
	CILIOPHORA			
	FLAGELLATA			
11	FLAGELLATA (1))		2835	
12	FLAGELLATA (2))		8505	2268
	TINTINNIDA			
13	*Codonellopsis sp.*		1701	
14	*Rhabdonella sp.*	3969	2268	1701
15	*Tintinnidae*	5103	1701	1134
	TROCHELMINTHES			
	ROTATORIA			
16	ROTATORIA (1)	1134		
Jumlah Individu/m^3		31185	39123	25515
Jumlah Taxa		13	13	11
Indeks diversitas H' = - E pi Ln pi		2.41	2.32	2.32
(SHANNON - WEAVER, 1949)				
H-max = Ln S		2.56	2.56	2.40
Equitailitas (E) = H'/H-max		0.94	0.90	0.97

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

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REPORT OF ANALYSIS

Number : 06815/LHP/VIII/2015

Principal : **URGENT SHIFT OF FERRY TERMINAL IN DEMOCRATIC TIMOR LESTE**
Address : Dili, Timor Leste
Identification number : 05958.25-27/B/08/2015
Description of sample : ***Benthos***
B1. Sea Water AL 3 (S 08° 33' 03,5" E 125° 34' 23,7")
B2. Between AL3 - AL4 (S 08° 32' 57,0" E 125° 34' 18,0")
B3. Sea Water AL 4 (S 08° 32' 55,2" E 125° 34' 15,3")
Method of sampling : SNI 13-4718-1998
Method of analysis : SNI 03-3401-1994
Date of sampling : August 01, 2015
Date of received : August 01, 2015
Date of analysis : August 01, 2015 up to August 26, 2015

Benthos :

NO	INDIVIDU	B1	B2	B3
	MOLLUSCA			
	BIVALVIA			
1	Veneridae			15
2	BIVALVIA (1)	15		
3	BIVALVIA (2)		15	15
	GASTROPODA			
4	*Acmaea sp.1*	15		
5	*Acmaea sp.2*		30	
6	*Bittium sp.*		30	30
7	*Cerithopsis sp.*	15	15	30
8	*Mitra sp.*		15	
9	*Nassarius (sp 1)*	15		15
10	*Nassarius (sp 2)*		15	
11	*Natica sp.*		15	
12	*Polynices sp.*	15		
13	*Triphora sp.*	60		
14	*Vexillum*		15	
15	GASTROPODA (1)			15
	ARTRHOPODA			
	CRUSTACEA			
16	*Apseudes sp.*	15		
17	AMPHIPODA	180		
	ANNELIDA			
	OLYGOCHAETA			
18	*Sternaspis sp.*		45	
19	*Cossuridae*			45
20	Nereidae (sp.1)			90
21	Phylodocidae	60	75	15
22	Spionidae	45		
23	POLYCHAETA (1)	30		
24	POLYCHAETA (2)			15
	SIPUNCULIDA			
25	SIPUNCULIDAE	15		
	NEMATHELMINTHES			
26	NEMATODA (sp.1)	240	15	180
27	NEMATODA (sp.2)		15	
Jumlah individu/m²		720	300	465
Jumlah Taxa		13	12	11
Indeks diversitas H' = - E pi Ln pi (SHANNON - WEAVER, 1949)		2.00	2.29	1.93
H-max = Ln S		2.56	2.48	2.40
Equitalitas (E) = H'/H-max		0.78	0.92	0.80

Jakarta, August 26, 2015
UNILAB PERDANA, PT.

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Japan Port Consultants, Ltd.

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Shinagawa-ku, Tokyo, Japan

Package-2: Natural and Environmental Survey for Preparatory Survey for the Project of the Urgent Shift of Ferry Terminal in Dili Port

Reference Contract Agreement, July 2015 by and between Japan Port Consultants, Ltd., (Tokyo, Japan), and PT. GEOMARINDEX (Jakarta, Indonesia)

FINAL REPORT
VOLUME 4 ECOSYSTEM SURVEY (TERRESTRIAL AND MARINE BIOTA)

Submitted to: **Japan Port Consultants, Ltd.**
TK Gotanda Bldg, 8-3-6, Nishi-Gotanda,
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Issued Date: **October 30, 2015**

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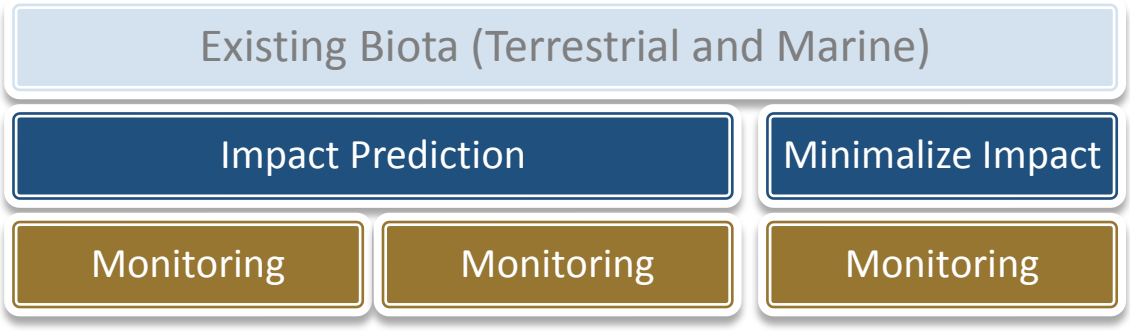
VOLUME 4
ECOSYSTEM SURVEY (TERRESTRIAL AND MARINE BIOTA)

4.1 INTRODUCTION

Terrestrial and marine biota survey is one of the important natural and environmental aspects to determine biological environmental information from the study area, in the case of assessing environmental pre-condition of ferry terminal in Dili Port, Timor-Leste before Ferry Terminal urgent shift or kind of development project. Biological diversity or biodiversity is the variety of all life forms. It encompasses three (3) levels of diversity: genetic, species and ecosystems. The Convention of Biological Diversity (CBD) defined biodiversity as the variability among living organisms such as terrestrial, marine and other aquatic systems. Biodiversity is constantly changing. It can be increased by genetic changes and evolutionary processes, or it can be reduced by threats that lead to biodiversity population decline and extinction. Biodiversity is the life-support system for all human beings. It provides food, health, shelter, medicine, fuel, clean air and water, contributes to local livelihoods, and regulates the overall climate system. Plants, animals, coral reef, and others kinds of organisms are playing role as bio-indicator of environmental health and ecosystem stability, as life alarm to warn quality decreasing because of physical or chemical over-intervention to the habitat.

Dili Port Ferry Terminal urgent shifting project will impact the existing environment condition, especially life organism near the project site. To prevent negative impact, the management should understand existing biodiversity condition as a baseline, predict and minimize environmental impact, also conduct regular monitoring. To provide biodiversity data baseline, biological team has surveyed terrestrial and marine biodiversity around project site. As we know on The National Biodiversity Strategy and Action Plan (NBSAP) of Timor-Leste 2010-2020 summarize that Timor-Leste have 2,448 biological species around 14.916.767 Km^2. Here we describe the methodology and result of the survey.



4.2 METHODOLOGY

4.2.1 Data Collection

Assessment method for terrestrial biology and marine biology is data collection by 3 Transects for each one of them 100 m cross the terrestrial, coastal and marine area. If there is woody plants, also assessed by sampling plot 20 m x 20 m. Data that already recorded are name, number, place/habitat, and interval of species found, special characteristic especially for unidentified species, and also photo if available to record.

4.2.2 Location

Data was collected in area around Dili Port, Timor-Leste (see Figure 1).

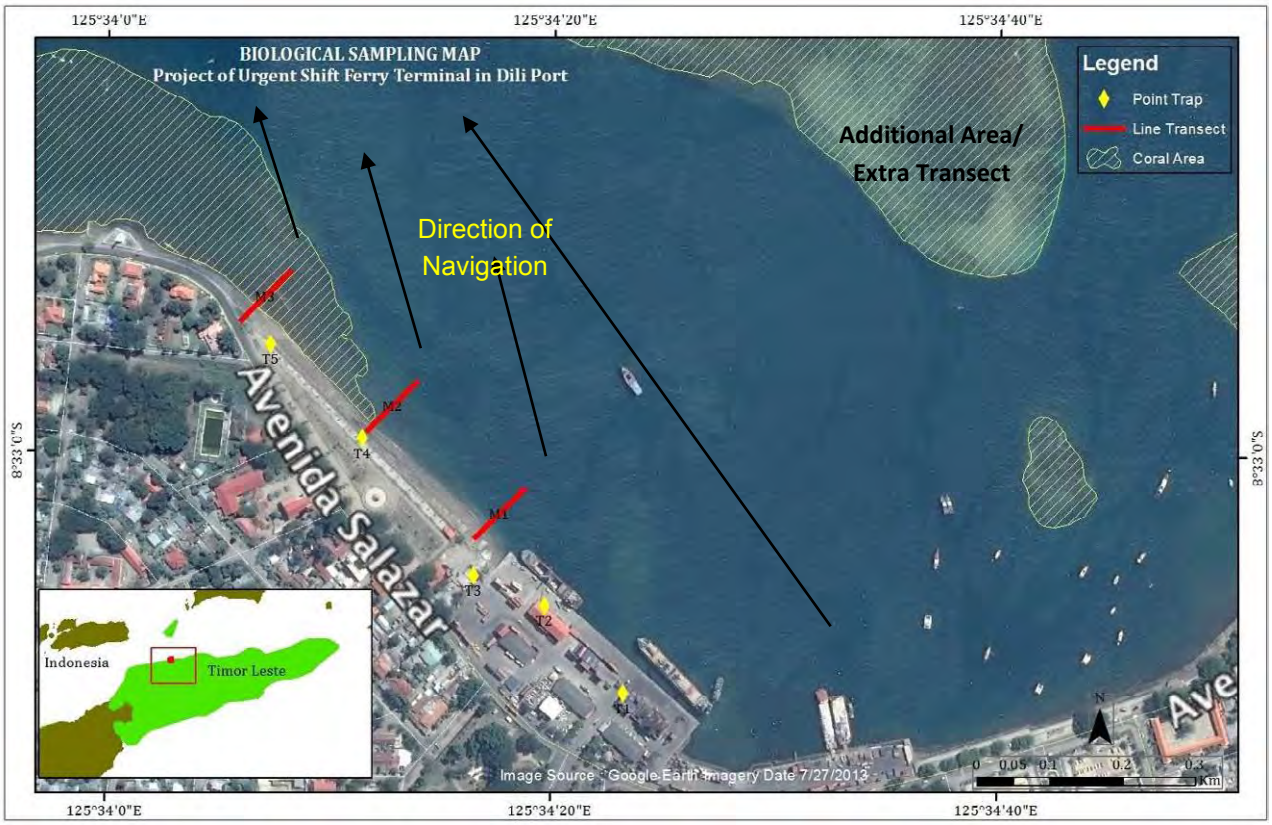


Figure 4.1 Sampling Location

4.3 DATA ANALYSIS

4.3.1 Species and Ecosystem Diversity

Species diversity is analyzed using Shannon Wiener Formula. All of individual sample catagorized in every taksonomy group, such as species and family. Shannon Wiener Formula (H') is used species diversity index measured by formula:

$$H' = -\sum_{i=1}^{R} p_i \ln p_i$$

Where : pi = proportion of species

4.3.2 Density/Abundance, Frequency, and Important Value Index

To understand size of a population in one study area in one period of time, we need to measure important value index (IVI) that contents of the percentage values of relative species density or at least it abundance and relative species frequency, for plant species with diameter, should be completed by relative dominance values. The index is used to determine the overall importance of each species in the community structure. Density (D) is number of individual sample of one species per area at on time, then also measured numerical strenght of a species in relation to the total number of individuals of all the species called relative density (DR), in other hands if there is no sufficient data to count the desity, the abundance is the alternative, which is proportional number of individual sample of one species whitout area comparison. The formula is :

D = N/A (for plot sampling)
= N/2w.L (for line Transect)
= N/π (3.14) .r^2 (for point count)
DR = (Di/Dtotal) x 100%

Where : D = density
DR = relative density
Di = density of species i
D total = total of all density species
N = number of species
A = area sampling
w = width of sampling
L = length of sampling
r = radius of sampling

The term of frequency (F) refers to the degree of dispersion of individual species in an area and usually discribe in term of percentage occurrence. It was studied by sampling of the study area at several places. The degree of dispersion of individual species in relation the number of all the species recorded called relative frequecy (FR). The formula is :

F = number of sampling area where species "i" found/total sampling area
FR = Fi/Ftotal

Where : Fi = Frequency of species "i"
Ftotal = Total of all frequency

Because of there is no plant or vegetation with diameter found in study area, the dominance values and the relatives is not analyzed. To measure Important Value Index (IVI) follow this formula:

$$IVI = DR + FR$$

4.3.3 List of Protected and Important Taxa

All of species or genus of biodiversity sampling result are matched with species protection list of International Union for Conservation Nature (IUCN), Convention of International Trade of Endangered Species (CITES), and local protection law or national biodiversity action plan in Timor-Leste.

4.4 RESULT

4.4.1 Terrestrial Biota

Terrestrial fauna diversity survey found seven species of 167 species of avifauna in Timor Leste, for any details, NSBAP of Timor-Leste indicates the presence of 151 terrestrial, 16 marine, and 91 terrestrial and marine birds. With regard to mammals, we only found one species from 69 terrestrial mammals listed in Timor-Leste. Most of them are common species which are found in urban area, like *Rattus norvegicus* (Norwegian rat) which are usually found in small garden near APORTIL office and *Passer montanus* (Eurasian Tree Sparrow), *Pycnonotus aurigaster* (the sooty-headed bulbul), *Hirundo tahitica* (Pacific Swallow) for avifauna which are found almost every where near and around the port. Some of them are also rarely found around area like *Egretta sacra sacra* (Pacific reef heron), we found it only one time when it flew around the beach.

Table 4.1 List of Terrestrial Biota that Exist in the Survey Area

TAXA	SPECIES	COMMON NAME	IVI
Mammals	*Rattus norvegicus*	Norwegian rat	0
Avifauna	*Pycnonotus aurigaster*	the sooty-headed bulbul	39.8
Avifauna	*Passer montanus*	Eurasian Tree Sparrow	53.5
Avifauna	*Ducula sp.*	-	11.1
Avifauna	*Hirundo tahitica*	Pacific Swallow	51.5
Avifauna	*Cuculus lepidus*	Sunda lesser cuckoo	11.1
Mammals	*Rattus norvegicus*	Norwegian rat	0

Primary Data : Tim Ecology Survey, August 2015

Figure 4.2 Avifauna around Project Site, *Passer montanus*, *Hirundo tahitica, Ducula* sp., *Pycnonotus aurigaster*

All of mammals and avifauna list are categorized in International Union for Conservation Nature (IUCN) Red-list as Least Concern, which means that it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, in other name the list does not qualify as for threatened category. The list is also not listed in Convention International Trade of Endangered Species (CITES). Species diversity index value (H') for avifauna is 1,423, it means that diversity is low and there is dominance of one or two species, that is *Passer montanus* and *Hirundo tahitica*. Mammals are not able to count of H' value because only one was record.

Terrestrial flora diversity survey only found one costal plant species *Ipomea pes-caprae* which was found around costal area near APORTIL, It grows on the upper parts of beaches and endures salted air and aslo one of the most common and most widely distributed salt tolerant plants and provides one of the best known examples of oceanic dispersal. Its seeds float and are unaffected by salt water. As describe on NBSAP of Timor-Leste, the natural vegetation is tropical dry broadleaf with an undergrowth of shrubs and grasses supporting a rich wildlife. Many trees are deciduous or partly deciduous, dropping their leaves during the dry season. There are also evergreen and thorn trees in the woodland mix. Typical trees of the lowland slopes include a tropical chestnut, *Sterculia foetida, Callophyllum teysmanii* and candlenut (*Aleurites moluccana*). The dominant native species available are *Eucalyptus alba, Eucalyptus urophylla, Pterocarpus indicus* and *Santalum albu*m. The most valuable among the native species are *Pterocarpus indicus* and *Santalum album*.

4.4.2 Marine Biota

The geographic positioning of Timor-Leste places it in a strategic area for marine biodiversity as part of the Coral Triangle. By approximately 700 kilometers long of coastal line, Timor-Leste is one of the center of marine biodiversity and home to 75 percent of all known coral species, more than 3,000 species of reef fishes, six of the seven known turtle species, whale sharks, manta rays and a diverse array of marine mammals such as 22 species of dolphin, and a variety of whale species. This survey showed that 18 marine plants consisting of 16 macro alga and seagrass of 28 species, 12 benthos species, 4 soft coral species, 17 hard coral species, and 7 species of fish were found in the northwest of the APORTIL (Dili Port) area.

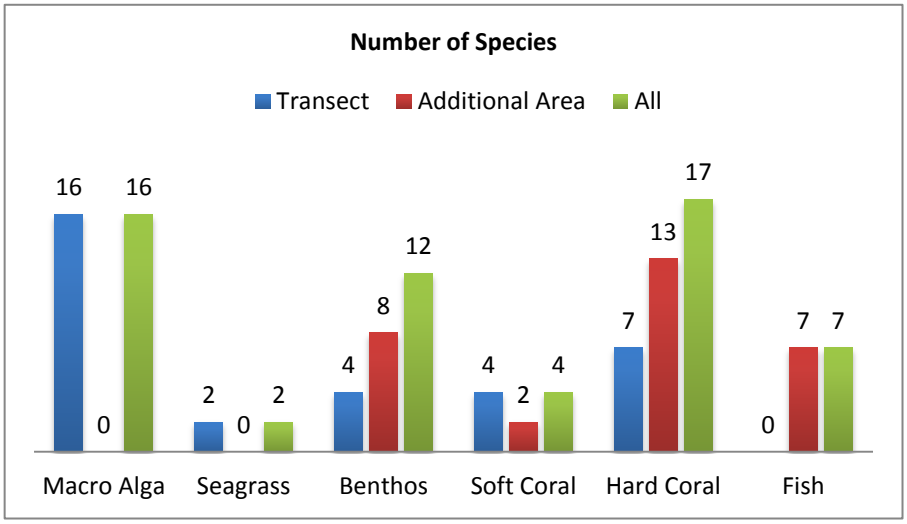


Figure 4.3 List of Species Number That Exist in The Survey Area

4.4.2.1 Transect 1

Transect 1 is existing location of Dili Port. There are already port operation activites such as docking and unloading ships. According to the result of ecology marine observation at Transect 1 coral reef such as soft corals, hard corals, or micro algae was not found. Basic condition consists of substrate mud with sea water condition are quite murky. At this location there were not any important types of biota that can be taken into consideration that the location is a conservation site or location with a high degree of diversity or fishing ground. So that ecologically, Transect 1 location is safe enough to become the location of port development.

4.4.2.2 Transect 2

Based on ecology observation at Transect 2, there are only mud substrate and not found coral and other corals such as hard corals, soft corals, and macro algae.

4.4.2.3 Transect 3

At Transect 3 there were 16 species of macro algae (sea weed), 2 species of sea grass, 4 species benthos, 4 soft coral species, and 7 hard corals.

4.4.2.4 Additional Area (Extra Transect)

At additional area or extra Transect there were 8 species benthos 2 soft coral species, 13 hard coral species, and all of the fish recorded outside.

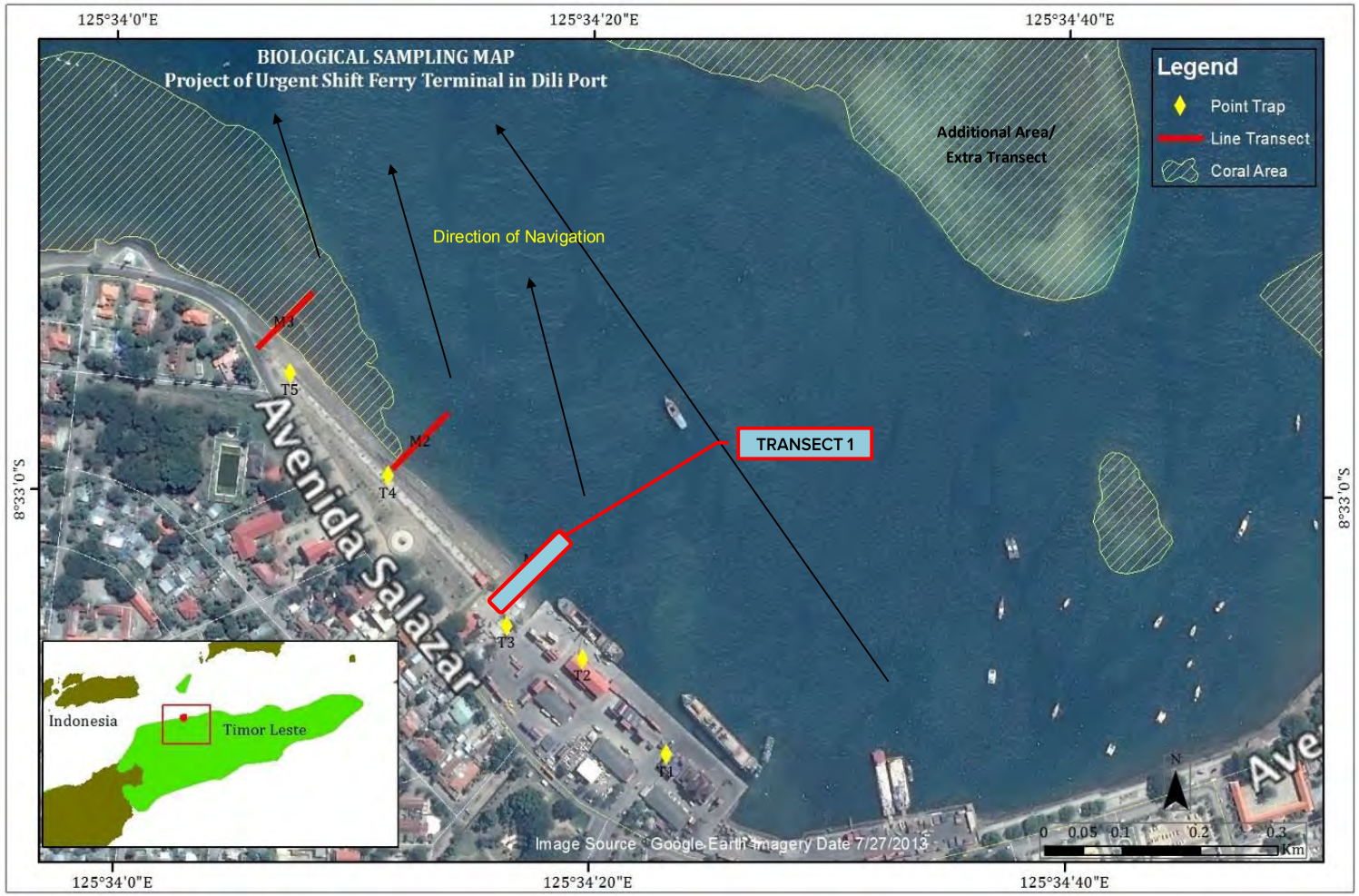
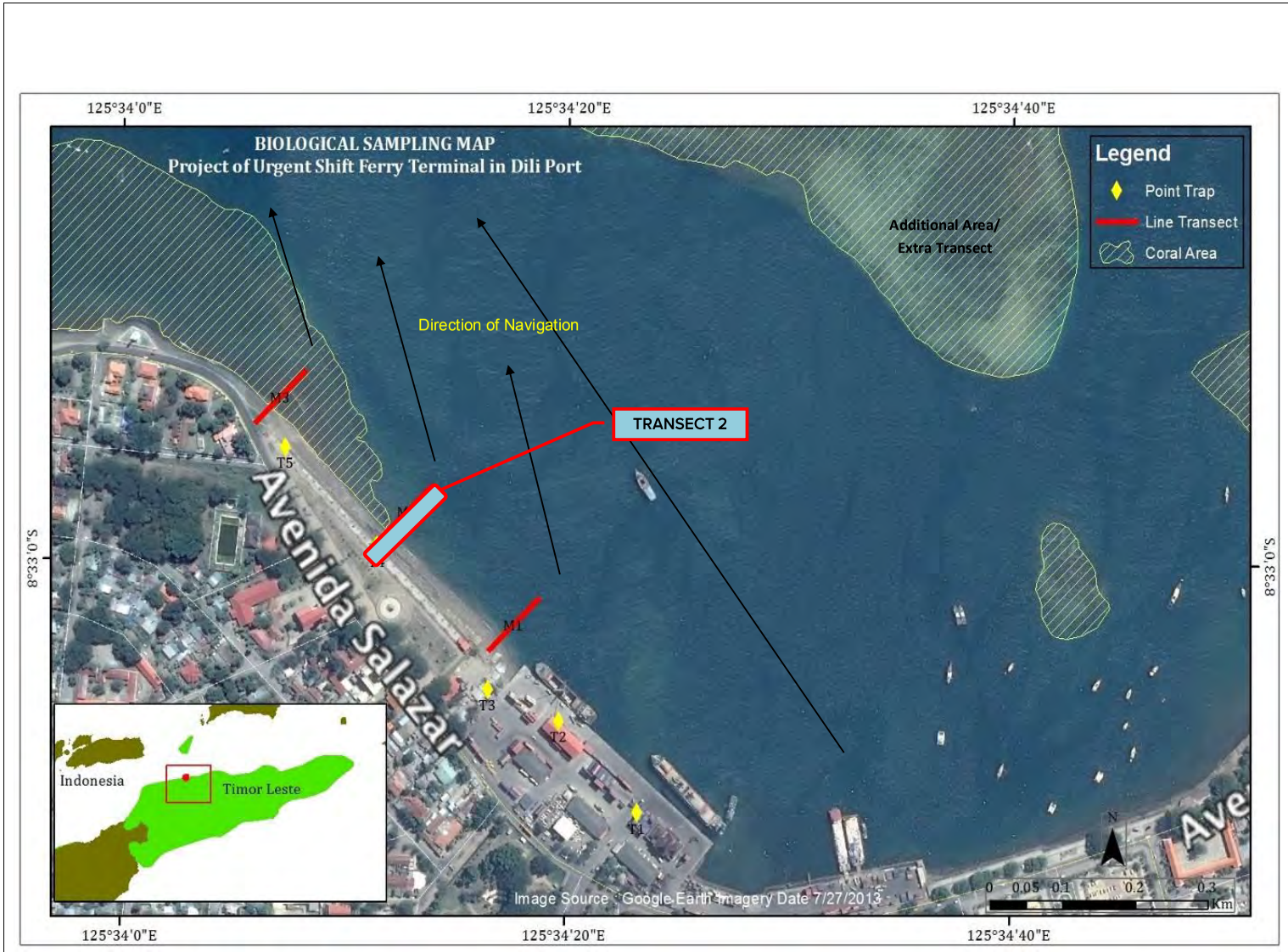


Figure 4.4 Sampling Location of Transect 1



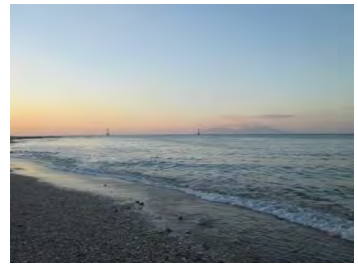
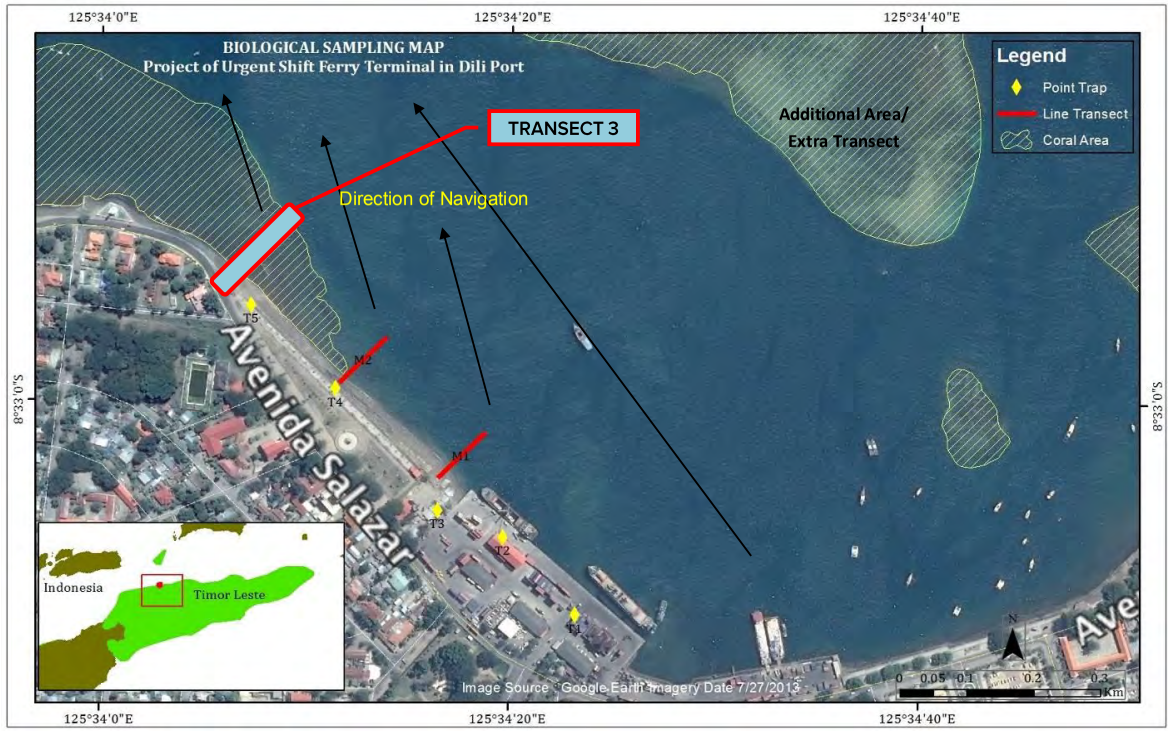
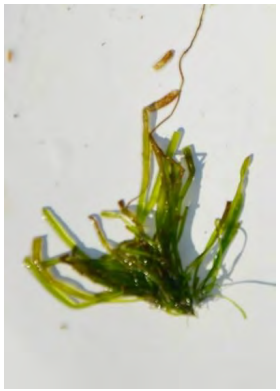


Figure 4.5 Sampling Location of Transect 2



Galaxea sp

Amphiroa sp



Enteromorpha intestinalis

Padina australis

Survey Activity

Halimeda renschii

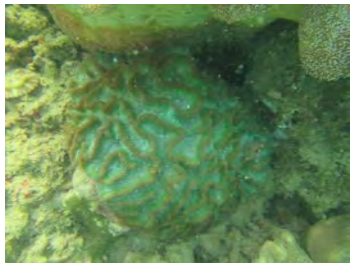
Ulva reticulata

Figure 4.6 Sampling Location of Transect 3

Didemnum molle

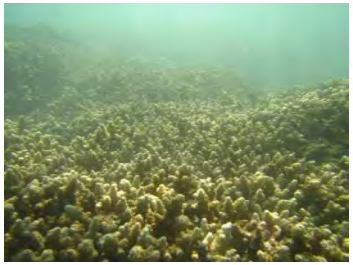
Callyspongia aerusuza

Heteractis crispa



Oulophyllia

Survey Activity



Acropora sp

Polyphillia talpina

Figure 4.7 Sampling Location of Extra Transect

4.5 CONCLUSIONS

Important coral was widely found in the end point of Transect 3 which is listed in Least Concern IUCN Redlist and six species of the coral were found in the additional area (extra sampling point) around 600 m north of Dili Port. **Table 4.2** below shows the point where corals were found.

Table 4.2 List of Species that have a IUCN Redlist

NO	SPECIES	LOCATION / GPS POINT	IUCN REDLIST
1	*Pocillopora damicornis*	Around Transect 3 125^0 34' 28,73" E 8^0 32' 47,86" E	Least Concern
2	*Diploastrea heliopora*	Around Additional Area/Extra Transect 125^0 34' 42,20" E 8^0 32' 05,36" E	Near Threatened
3	*Polyphyllia talpina*		Least Concern
4	*Heliofungia actiniformis*		Vulnerable
5	*Fungia concinna*		Least Concern
6	*Pachyseris speciosa*		Least Concern
7	*Coeloseris mayeri*		Least Concern

Primary Data : Tim Ecology Survey, August 2015
Notes : - = not have English/common name, usually common name is brad mark name.

In order to understand the condition of the coral and other important species distribution around the project site, the survey at the additional area was conduct for comparison purpose.

Figure 4.8 Hard Coral Around Additional Area (Extra Transect), *Diploastrea heliopora, Polyphyllia talpina, dan Heliofungia actiniformis*

Figure 4.9 Hard Coral around Transect 3, *Pocillopora damicornis*

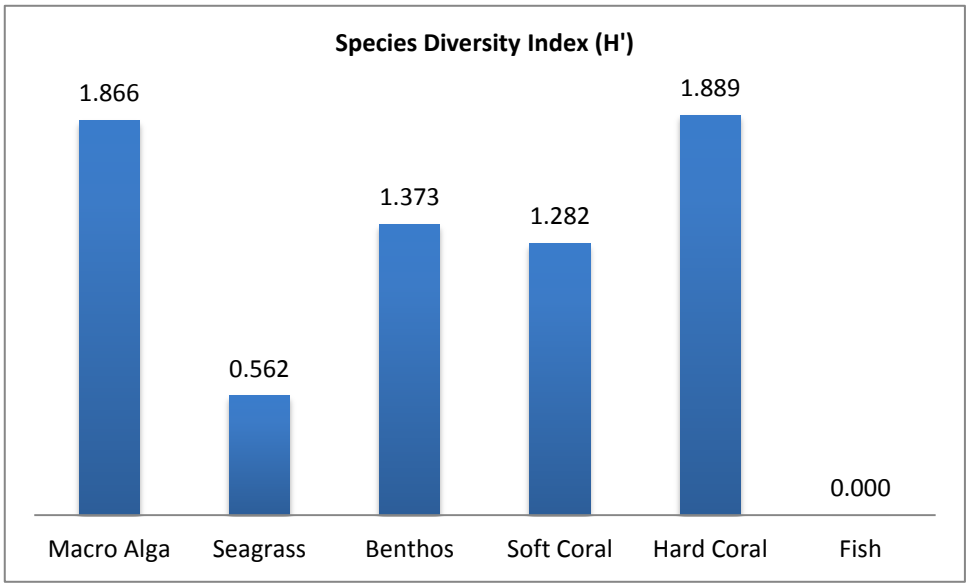


Figure 4.10 Species Diversity Index

All of marine biota listed have different diversity and condition and shown in species diversity index. Macro alga and Hard Coral have similar value, because some of live and dead hard coral provide habitat for macro alga. Benthos also has similar value, despite benthos is higher, because it has any similar habitat with soft coral. Sea grass has lowest value, because common substrate in coastal area is hard rock and soft area degraded by wave and human activities. All of fish species were only found outside Transect and the data is unable to conduct H' analysis. There are two species of hard coral listed in IUCN Redlist as Near Threatened, *Diploastrea heliopora* and Vulnerable, *Heliofungia actiniformis*. Both of them need serious handling to prevent extinction. Project area should have the minimum environmental impact by avoiding physical and chemical destruction. But both of them are found in additional area or Extra Transect not only in the main location of port development. Additional locations are only used as a comparison only for the handling of the environmental impact of the port activities in the future.

1. Terrestrial biodiversity have 7 species avifauna with species diversity 1,247; 1 species mammals and 1 coastal plant. None of them are listed on endangered protection status.
2. Marine biodiversity have 16 species macro alga, 2 species sea grass, 12 species benthos, 4 species soft coral, 17 species hard coral and 7 species fish and all of them are only found in the location of Transects 3 and an additional area. One type of coral that have the status of Least Concern IUCN Redlist (A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category) were found at Transect 3 only.
3. There are 2 hard coral species assessed as vulnerable and near threatened but both of them were found in additional area or Extra Transect not in the main location to be used for Dili port development. Additional locations were surveyed only for comparison purpose. (Appendix 4.7 List of Marine Biota).

4. Coral reef or coral species were not found in Transect 2 and Transect 1 so it can be recommended as a location for Dili Port development.
5. Site conditions around Dili port is still relatively well so the survey result can be used as a reference for the monitoring plan, in order to prevent/mitigate the negative environmental impact to the species of coral and fish around the site.
6. The existence of the existing port so far does not interfere with the existence of the coral and other species. The environmental conditions should be maintained by conducting periodic monitoring of the condition of marine ecology, terrestrial and marine water quality so that the negative impact on the surrounding environment can be managed and monitored properly.

4.6 REFERENCES

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4.7 APPENDIX

Table 4.3 List of Terrestrial Biota

NO	TAXA	FAMILY	ENGLISH NAME	SCIENTIFIC NAME	Σ	DR	FR	IVI	IUCN	CITES
1	Mammals	Muridae	Norwegian Rat	*Rattus norvegicus*	3				LC	-
2	Avifauna	Pycnonotidae	The sooty-headed bulbul	*Pycnonotus aurigaster*	11	21.57	18.18	39.75	LC	-
3	Avifauna	Passeridae	The Eurasian tree sparrow	*Passer montanus*	18	35.29	18.18	53.48	LC	-
4	Avifauna	Columbidae		*Ducula sp*	1	1.96	9.09	11.05		-
5	Avifauna	Hirundinidae	Pacific swallow	*Hirundo tahitica*	17	33.33	18.18	51.52	LC	-
6	Avifauna	Cuculidae	Sunda Cucko	*Cuculus lepidus*	1	1.96	9.09	11.05	LC	-
7	Avifauna	Scolopacidae	Sharp-Tailed sandpiper	*Calidris acuminata*	2	3.92	18.18	22.10	LC	-
8	Avifauna	Ardeidae	Pacific Reef Heron	*Egretta sacra sacra*	1	1.96	9.09	11.05	LC	-

Note: Important Value Index (IVI) is one of the parameters used in calculating the measurements of communities of organisms.

Table 4.4 List of Marine Biota

NO	TAXA	FAMILY	ENGLISH NAME	SPECIES	Σ	COORDINATE		TRANSECT				DR	FR	IVI	PROTECTION	
						X	Y	1	2	3	ADD				IUCN	CITES
1	Macro Alga	Caulerpaceae	*The Sea Grape*	*Caulerparacemosa*	5	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	1.309	6.250	7.559	-	-
2	Macro Alga	Caulerpaceae	*The Green Feather Alga*	*Caulerpasertularoides*	2	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	0.524	6.250	6.774	-	-
3	Macro Alga	Cladophoraceae	-	*Chaetomorphacrassa*	6	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	1.571	6.250	7.821	-	-
4	Macro Alga	Coralinaceae	-	*Amphiroasp*	2	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	0.524	6.250	6.774	-	-
5	Macro Alga	Dictyotaceae	*The Brown Alga*	*Padinaaustralis*	110	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	28.796	6.250	35.046	-	-
6	Macro Alga	Dictyotaceae	-	*Dictyotabartayresiana*	3	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	0.785	6.250	7.035	-	-
7	Macro Alga	Dictyotaceae	-	*Padinatetrastomatica*	8	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	2.094	6.250	8.344	-	-
8	Macro Alga	Galaxauraceae	-	*Galaxauraarborea*	1	125° 34' 12,61" E	8° 32' 56,428" S	-	-	✓	-	0.262	6.250	6.512	-	-

NO	TAXA	FAMILY	ENGLISH NAME	SPECIES	Σ	COORDINATE		TRANSECT				DR	FR	IVI	PROTECTION	
						X	Y	1	2	3	ADD				IUCN	CITES
9	Macro Alga	Gracilariaceae	-	*Gracillariacanaliculata*	10	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	2.618	6.250	8.868	-	-
10	Macro Alga	Gracilariaceae	-	*Gracillariacurtissae*	2	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	0.524	6.250	6.774	-	-
11	Macro Alga	Halimedaceae	-	*Halimedagracillis*	28	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	7.330	6.250	13.580	-	-
12	Macro Alga	Halimedaceae	-	*Halimedarenschii*	1	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	0.262	6.250	6.512	-	-
13	Macro Alga	Rhodomelaceae	*Mustard Limu*	*Laurencianidifica*	8	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	2.094	6.250	8.344	-	-
14	Macro Alga	Ulvaceae	-	*Ulvareticulata*	130	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	34.031	6.250	40.281	-	-
15	Macro Alga	Ulvaceae	-	*Enteromorphaintestinalis*	25	125^0 34' 12,61" E	8^0 32' 56,428" S	-	-	✓	-	6.545	6.250	12.795	-	-
16	Macro Alga	Ulvaceae	-	*Ulvalactuca*	41	125^0 34' 12,85" E	8^0 32' 56,19" S	-	-	✓	-	10.733	6.250	16.983	-	-
17	Sea Grass	Hydrocharitaceae	-	*Enhalusacoroides*	33	125^0 34' 12,85" E	8^0 32' 56,19" S	-	-	✓	-	75.000	50.000	125.000	-	-
18	Sea Grass	Hydrocharitaceae	-	*Halophilaovalis*	11	125^0 34' 12,85" E	8^0 32' 56,19" S	-	-	✓	-	25.000	50.000	75.000	-	-
19	Benthos	Sabellidae	-	*Sabellastartesp*	3	125^0 34' 12,85" E	8^0 32' 56,19" S	-	-	✓	-	27.273	25.000	52.273	-	-
20	Benthos	Serpulidae	*Christmas Tree Worms*	*Spirobranchusgiganteus*	3	125^0 34' 28,73" E	8^0 32' 47,86" S	-	-	✓	-	27.273	25.000	52.273	-	-
21	Benthos	Suberitidae	-	*Aaptossp 1*	3	125^0 34' 12,85" E	8^0 32' 56,19" S	-	-	✓	-	27.273	25.000	52.273	-	-
22	Benthos	Suberitidae	-	*Aaptossp 2*	2	125^0 34' 28,73" E	8^0 32' 47,86" S	-	-	✓	-	18.182	25.000	43.182	-	-
23	Benthos	Callyspngiidae	-	*Callyspongiaaerisuza*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
24	Benthos	Suberitidae	-	*Aaptos sp.*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
25	Benthos	Phyllidiidae	*Sea Slug*	*Phyllidiavaricosa*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
27	Benthos	Didemnidae	*The Tall Urn Ascidian*	*Didemnummolle*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
28	Benthos	Clavelinidae	*Tunicate Black Orange*	*Clavelinarobusta*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
29	Benthos	Stichodactylidae	*Sebae Anemone*	*Heteractiscrispa*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
30	Benthos	Stichodactylidae	*Ritteri Anemone*	*Heteractismagnifica*	-	125^0 34' 42,20" E	8^0 32' 05,36" S	-	-	-	✓	-	-	-	-	-
31	Soft Coral	Alcyoniidae	-	*Sarcophytonsp*	7	125^0 34' 28,73" E	8^0 32' 47,86" S	-	-	✓	-	43.750	25.000	68.750	-	-
32	Soft Coral	Alcyoniidae	-	*Sinulariasp 2*	3	125^0 34' 28,73" E	8^0 32' 47,86" S	-	-	✓	-	18.750	25.000	43.750	-	-
33	Soft Coral	Alcyoniidae	-	*Sinulariasp*	4	125^0 34' 28,73" E	8^0 32' 47,86" S	-	-	✓	-	25.000	25.000	50.000	-	-

NO	TAXA	FAMILY	ENGLISH NAME	SPECIES	Σ	COORDINATE		TRANSECT				DR	FR	IVI	PROTECTION	
						X	Y	1	2	3	ADD				IUCN	CITES
34	Soft Coral	Nephtheidae	-	*Neptheasp*	2	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	12.500	25.000	37.500	-	-
35	Hard Coral	Faviidae	-	*Goniastreasp*	1	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	11.111	14.286	25.397	-	-
36	Hard Coral	Faviidae	-	*Faviasp*	2	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	22.222	14.286	36.508	-	-
37	Hard Coral	Faviidae	-	*Favitessp 2*	1	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	11.111	14.286	25.397	-	-
38	Hard Coral	Faviidae	-	*Favitessp 1*	1	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	11.111	14.286	25.397	-	-
39	Hard Coral	Oculinidae	-	*Galaxeasp*	2	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	22.222	14.286	36.508	-	-
40	Hard Coral	Pocilloporidae	*Cauliflower Coral*	*Pocilloporadamicornis*	1	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	11.111	14.286	25.397	LC	-
41	Hard Coral	Poritidae	-	*Poritessp*	1	125°34' 28,73" E	8°32' 47,86" S	-	-	✓	-	11.111	14.286	25.397	-	-
42	Hard Coral	Faviidae	-	*Oulophylliasp*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
43	Hard Coral	Faviidae	*Diploastrean Brain Coral*	*Diploastreaheliopora*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	NT	-
44	Hard Coral	Fungidae	*Father Coral*	*Polyphylliatalpina*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	LC	-
45	Hard Coral	Fungidae	*Long Tentacle Coral*	*Heliofungiaactiniformis*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	VU	-
46	Hard Coral	Fungidae	*Disc Coral*	*Fungiaconcinna*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	LC	-
47	Hard Coral	Pectiniidae	-	*Pectiniasp*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
48	Hard Coral	Oculinidae	-	*Galaxeasp*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
49	Hard Coral	Agariciidae	-	*Pachyserisspeciosa*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	LC	-
50	Hard Coral	Agariciidae	-	*Coeloserismayeri*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	LC	-
51	Hard Coral	Acroporidae	-	*Acroporasp*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
52	Fish	Pomacentridae	-	*Amphiprionsp*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
53	Fish	Pomacentridae	*Lemon Damselfish*	*Pomacentrusmoluccensis*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
54	Fish	Pomacentridae	*Lagoon Damselfish*	*Hemiglyphidodonplagiometopon*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
55	Fish	Pomacentridae	-	*Cheiloprionlabiatus*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
56	Fish	Pomacentridae	*Bluefin Damselfish*	*Paraglyphidodonmelas*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	-	-
57	Fish	Labridae	*Blue Diesel Wrasse*	*Labroidesdimidiatus*	-	125°34' 42,20" E	8°32' 05,36" S	-	-	-	✓	-	-	-	LC	-

NO	TAXA	FAMILY	ENGLISH NAME	SPECIES	Σ	COORDINATE		TRANSECT				DR	FR	IVI	PROTECTION	
						X	Y	1	2	3	ADD				IUCN	CITES
58	Fish	Labridae	*Yellowtail tubelip*	*Diproctacanthusxanthurus*	-	125^0 34’ 42,20” E	8^0 32’ 05,36” S	-	-	-	✓	-	-	-	LC	-

Note: Important Value Index (IVI) is one of the parameters used in calculating the measurements of communities of organisms.

(-) = not have English/common name, usually common name is brad mark name.