INTEC ENGINEERING PTY. LTD.

REPORT FOR

EAST TIMOR PIPELINE - FEASIBILITY STUDY

OCEANIC EXPLORATION

June 2002

PROJECT NO: P0063.01 REV 0

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DOCUMENT REVIEW SHEET

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PROJECT: East Timor Pipeline – Feasibility Study			
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PROJECT MANAGER David Raby		**FILE NO:** P0063.01	
SPELL CHECK (WP OPERATOR) BY:		**SECTION:**	

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Reviewers Comments:					

N-QAF05.0

TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

1.1 GENERAL

Oceanic Exploration has commissioned INTEC to examine the technical and economic feasibility of a pipeline to East Timor.

The primary fields considered for the pipeline are:

- Bayu Undan
- Greater Sunrise.

The proposed landfall is Suai in East Timor.

1.2 SCOPE OF WORK

This desktop study was commissioned for the technical feasibility and cost analysis for pipelines from Greater Sunrise and Bayu Undan to East Timor and Australia. The options are listed below:

Option 1

A pipeline of sufficient size to feed an LNG plant to be built at Suai in East Timor.

Option 2

A pipeline to Suai that is of sufficient size to deliver the domestic energy requirements of the 820,000 people of East Timor.

Option 3

The optimum way of connecting Greater Sunrise and Bayu Undan to East Timor via a pipeline system.

In addition, estimate the cost of a pipeline between Bayu Undan and Darwin in Australia.

2. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

2.1 SUMMARY

For a pipeline landing at Suai in East Timor the closest field is Bayu Undan rather than Greater Sunrise. The maximum water depth from Bayu Undan to Suai is 2,500m. The following pipelines are required for the two different cases considered:

Option 1

LNG plant requires a pipeline of an Outside Diameter of 28-inch. The cost from Bayu Undan is approximately USD343million.

Option 2

For domestic use only a pipeline of Outside Diameter of 10-inch is required. The cost from Bayu Undan is approximately USD143million.

Installation of both pipelines is considered technically feasible with current installation equipment.

2.2 CONCLUSION:

- There are sufficient reserves close to East Timor for a viable LNG plant.
- The shortest distance is from Bayu Undan to Suai rather than Greater Sunrise to Suai.
- Laying a pipeline in water depths greater than 2,500m is practical with currently available equipment.
- Large diameter pipelines are being designed at present for installation at depths greater than 3,000m.
- A pipeline of an outside diameter of 28-inch is sufficient for an LNG plant.
- A pipeline from Bayu Undan to Suai is potentially significantly cheaper than a pipeline to Darwin.

2.3 RECOMMENDIATIONS:

- More detailed information is required of the pipeline route, geotechnical nature of the route and environmental data.
- Further engineering needs to be performed to determine accurately the pipeline dimensions and wall thicknesses.
- The LNG location at Suai needs to be considered further, including the ease of docking LNG tankers there.
- Consider alternative landfall locations, which may provided easier access to the domestic market.

3. LOCATION

3.1 RESERVES

The Bayu Undan and Sunrise fields are in the Timor Sea. The approximate locations are indicated in drawing A-0129.01-DWG-001 Appendix 1.

It is estimated that the fields contain the following reserves:

	Condensate MMbbl	Gas Tcf	Ref
Bayu Undan	400	3.45	1
Sunrise	298	8.35	2

In addition to these fields, the following fields in the vicinity have been discovered but are as yet undeveloped.

Oil Fields	Gas Fields
• Buller	• Kelp
• Jahal	• Chuditch
• Krill	• HingKip
• Bluff	• Evans Shoal

These fields represent a significant reserve of petroleum products. There are numerous options for developing these fields, such as FPSO's, floating LNG, and tiebacks to landfalls.

As stated previously (section 1), the purpose of this report is to consider the option of delivering the reserves via a pipeline to shore.

3.2 ROUTE

The approximate distance from Suai to:

- Bayu Undan is approximately 230 km
- Greater Sunrise is approximately 275 km

As Bayu Undan is closer to Suai this was selected as the primary route to East Timor.

An alternative route could be from Greater Sunrise to the North East of East Timor which would be of a approximate distance of 172 km. This option was not considered further within this report as it is not considered the primary case.

3.3 LANDFALL

As part of this work INTEC was asked to consider the landfall at Suai.

Other landfall locations may be more suitable for the pipeline but since no detailed project information is available, a detail review is not possible.

The landfall at Suai has been selected because of the following facts:

- The pipeline distance between Bayu Undan and Suai is relatively short.
- It is understood that the Suai location is relatively clear of industrial developments.
- From Reference [3] the water depths close to shore appear to show a lower gradient than other locations.

If a separate pipeline was required from Greater Sunrise to East Timor a location to the east of East Timor could alternatively be considered.

3.4 CONCLUSION

- There are significant hydrocarbon reserves within 300 km of East Timor.
- Of the larger reserves, Bayu Undan is closer to Suai East Timor than Greater Sunrise. A landfall at Suai is considered acceptable.

4. PIPELINE ROUTING

As part of the East Timor Pipeline Study, several pipeline route options were considered from Bayu Undan or Greater Sunrise to East Timor. These routes are all deepwater routes, reaching a maximum water depth of approximately 2,300m to 3,500m in places.

This section provides a further, more detailed evaluation of these deepwater pipeline routes. It should be noted that no detailed geophysical data was available for this study.

The evaluation is based on bathymetric data Reference [3].

All routes that traverse the continental slopes may potentially encounter significant geohazards in addition to high seabed gradients, locally in excess of 30 degrees. Slope instability, landslides, debris and turbidity flows, as well as faults, some with surface expression, will control route selection.

An existing geophysical dataset may exist (GEOMAR), which contains detailed multibeam bathymetric data over several sections of the routes. It is recommended that this dataset be obtained such that a local evaluation of pipeline routing may be performed within these route sections. The ability to do this evaluation before performing the reconnaissance survey is considered beneficial as the survey may be performed along more favorable routes and over a more applicable extent, which will optimize survey scope and costs.

4.1 BAYU UNDAN TO SUAI

Deepwater pipeline routes from Bayu Undan to East Timor may be segmented as follows:

- Continental slope – East Timor
- Continental slope – Australia
- Maximum Water depth

An evaluation of each segment is presented below.

4.1.1 Continental Slope – East Timor

The continental shelf in the vicinity of Suai slopes to the southeast. The pipeline route presented in the A-0129.01-DWG-001 passes down the continental slope at a suitable angle, and is considered to be acceptable for the following reasons:

- The nearshore route by observation is acceptable for the following:
  - From Reference [3] the slope from land is relatively gentle.
  - Close to Suai is outlet for the Talara river. This usually assists in easing the construction of a landfall as the river deposits materials and hence eases pipeline construction.
- The route misses any existing facilities.

4.1.2 Continental Slope – Australia

The pipeline route presented in the A-0129.01-DWG-001 passes down the Australian continental slope at a suitable angle, and is considered to be acceptable for the following reasons:

- The slope from Bayu Undan to the maximum water depth is considered to be of an acceptable gradient from observation.
- The route misses any existing facilities.

4.1.3 Maximum Water Depth

From Reference [3] the maximum water depth is inferred to be approximately 2,500m for the selected route.

4.2 CONCLUSION

From the data available, the maximum water depth for the pipeline to East Timor is approximately 2,500m.

The route at this stage appears to be practical but more project-specific data is required to confirm this.

5. PIPELINE CHALLENGES

5.1 GENERAL

The pipeline water depth, as previously stated, is approximately 2,500m. There is a possibility that the water depths could be in the region of 3,000m, depending on the pipeline route chosen.

Appendix 2 details the current status of deepwater pipelines in the world. The deepest pipeline laid at present is at a water depth of 1,650m. This equates to an increase in the water depth of between 50% and 90%. It should be noted that pipelines are being designed at present for depths in excess of 3,000m.

The following section outlines the main pipeline challenges of laying a pipeline in deepwater. It is assumed that the maximum outside diameter for a pipeline from Bayu Undan to East Timor is 28-inch (this is justified in section 6 of this report).

- Design

Preliminary calculations for the East Timor pipeline have determined a wall thickness of less than 45 mm of high-grade material.

The size and wall thickness is currently at the maximum of what worldwide pipe mills can produce.

- Geo-Hazards

No site-specific data was available for this work. This area of the project needs to be investigated in greater depth.

With regards to seismic activity no project specific data was available. Other pipelines have been laid/designed over similar areas such as Malampaya, Oman to India and Sakahlin to Japan.

- Side Slope Stability

Generally, side slope stability along the pipeline route needs to be confirmed by performing a site survey. A suitable route could be found along the south coast of East Timor.

- Pipelay

As noted in Appendix 3, Heerema has confirmed that the MSV Balder is capable of installing a 28-inch outside diameter pipeline in 3,000m.

Construction companies such as Allseas and Saipem also have deep water pipeline installation capability, such as J lay rigs.

- Maintenance and Installation

One of the main differences between shallow water (less than 200m) and deepwater pipelines is the use of divers to maintain and install the pipeline. The maximum water depth in which an unprotected diver can survive is less than 800m. The current allowable maximum water depth in which an unprotected diver is allowed to work in the North Sea is less than 200m.

The pipelines that have been laid in the Gulf of Mexico are in excess of 1,500m (ref appendix 2). All these pipelines have been laid, installed and maintained using Remote Operated Vehicle technology. Maintenance includes equipment for Pipeline Repair, intelligent inspection and inspection.

The same technology that has been used to install these pipelines can be used to install pipelines in a water depth of 3,000m.

5.2 CONCLUSION

Laying a pipeline in a water depth of 2,500m to 3,000m is not a significant problem with current technology. Pipelines are being designed for installation in a water depth greater than 3,000m.

Similar pipelines have been laid in the world in similar coastal environments and deepwater.

6. PIPELINE SIZING

General

A 220km pipeline from Bayu Undan to Suai may be used to either supply the domestic East Timor market or feed into an LNG plant. The following pipeline sizes have been chosen:

- Option 1 – 28 inch Outside Diameter Pipeline for a Liquid Natural Gas plant
- Option 2 – 10 inch Outside Diameter Pipeline for domestic use

The following pressures were assumed for both pipelines:

Inlet Pressure 190 bar

Outlet pressure 50 bar

Option 1 – 28 inch Diameter Pipeline

For an LNG plant to be feasible the production rate must be in the region of 1,000 mmscfd of gas, based on previous work performed by INTEC.

Preliminary calculations have been performed using the following pipeline parameters:

- Outside diameter 28 inch
- Wall thickness less than 45mm

Calculations show that a 28-inch pipeline can flow approximately 1,000 mmscfd of gas, with reasonable inlet and outlet pressures. This indicates that this size is sufficient for the LNG plant.

Option 2 – 10-inch Diameter Pipeline

To supply East Timor's population and domestic market, the consumption and pipeline size was established as follows:

An estimate of the consumption per capita in Timor is based on those generated by the IEO1997 World Energy Consumption of 1997. An average was taken in 1997 and those forecasted for 2005 for developing countries. These figures are substantiated by comparing them to the consumption per capita for the Philippines, which is used for comparisons of economic condition.

The following values were calculated/assumed:

Yearly Consumption

East Timor population	820,000
Consumption per Capita per year	25 mmBtu (Philippines 22mmBtu)
Total mmBtu per year	20,500,000
Gas (scf of gas produces 1027Btu)	**19,960 mmscf/year**

Preliminary calculations have been conducted using the following pipeline parameters:

- Outside diameter 10inch
- Wall thickness less than 25mm

Calculations show that a 10-inch pipeline produces over 24,000 mmscf/year of gas, which indicates that this size may be sufficient to provide the domestic market.

6.1 CONCLUSIONS

- A 28-inch pipeline to feed into an LNG plant is potentially feasible.
- A 10-inch pipeline would be adequate to supply the domestic market of East Timor.

7. ECONOMICS AND COSTING

7.1 GENERAL

The costing data sheets are contained in Appendix 4 of this document for the following pipelines:

Option 1

The cost of the 28-inch Outside Diameter Pipeline from Bayu Undan to Suai would be approximately USD 317 million.

Option 2

A 10-inch Outside Diameter Pipeline from Bayu Undan to Suai would cost approximately USD 143 million.

Option 3

The cost of the 28-inch Outside Diameter Pipeline from Sunrise to Bayu Undan would be approximately USD 171 million.

Numerous pipeline sizes have been considered for the Bayu Undan to Darwin pipeline. As stated in Reference [4] the cost of the Bayu Undan to Darwin may be USD 732.75 million. It is not know what size of the pipeline this is based upon.

As the pipeline distance from Bayu Undan to Darwin is approximately 500 km the flow of a 28-inch Outside Diameter Pipeline would be less than for a pipeline to Suai (only 220km). It is considered that a pipeline of an outside diameter of 32-inch from Bayu Undan to Darwin should deliver the same flow as a 28-inch Outside Diameter Pipeline from Bayu Undan to Suai. Performing a comparative costing using the same basis of estimating indicates that a 32-inch Outside Diameter Pipeline from Bayu Undan to Darwin would be USD 571 million.

7.2 CONCLUSION

The prices above are approximate, as no specific project data was available for this report. Variations in scope, technical details, and items such as owner's costs, etc. could produce a –20% to +50% cost variation.

The figures above indicate that a pipeline from Bayu Undan to Suai would cost significantly less than a pipeline to Darwin.

8. REFERENCES

1. Phillips Petroleum Press release "Status announcement "21/02/2001.

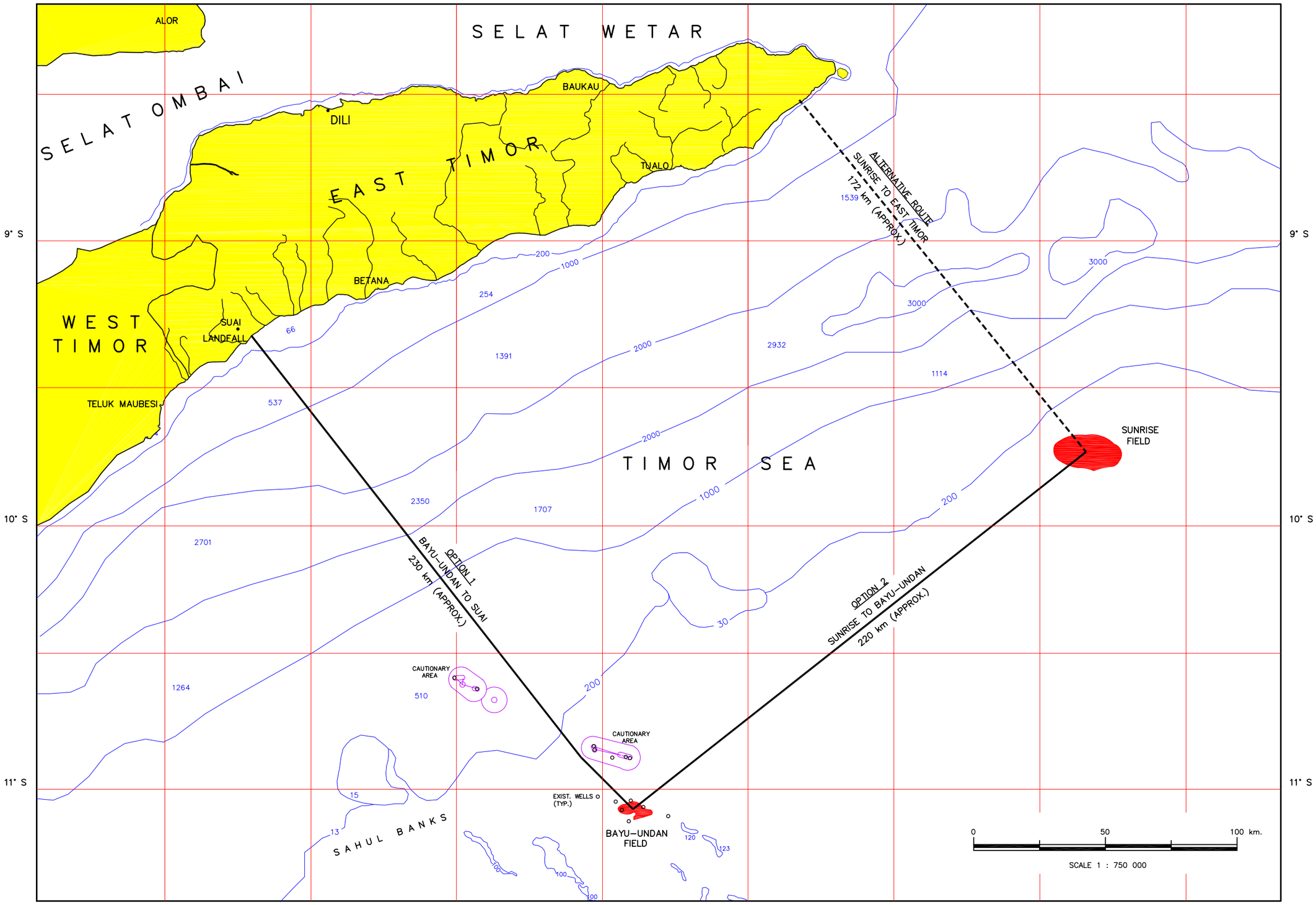
2. Woodside Press Release "Sunrise Gas Project".

3. Admiralty Chart AUD 4603 "Australian - North Coast and Adjacent Waters".

4. Upstream Article 25/09/2001 "Timor Rescue Attempt".

APPENDICES

APPENDIX 1 - DRAWINGS



NOTES

1. WATER DEPTHS ARE IN METRES AND REDUCED TO CHART DATUM.

LOCATION	APPROX. COORDINATES	
	EAST	SOUTH
SUNRISE FIELD	128° 10' 00"	9° 45' 00"
BAYU-UNDAN FIELD	126° 36' 46"	11° 04' 10"
LANDFALL	125° 17' 45"	9° 19' 25"

REV.	REVISIONS	DATE	DRAWN	DRAFTING SUPV.	CHKD. CONSULTANT	APPD. CONSULTANT	CHKD. CLIENT	APPD. CLIENT
0	ALTERNATIVE ROUTE SUNRISE TO EAST TIMOR ADDED	11.6.02	THAVA	THAVA	DAR	SJR		
A	ISSUED FOR COMMENTS	30.5.02	THAVA	THAVA	DAR	SJR	–	

DRAWN BY: K.THAVA
DATE: 14.5.2002
SCALE: 1 : 750 000 (A1)
CHKD:
APPD:
CONSULT.
CLIENT

TITLE

BAYU-UNDAN TO EAST TIMOR DEEPWATER PIPELINE

SUBSEA PIPELINE ROUTE

INTEC ENGINEERING

CAD FILE NAME: A-0129.01-DWG-001

DRAWING NO.: A-0129.01-DWG-001

REV. NO.: 0

APPENDIX 2 - DEEPWATER PIPELINE DATA

DEEPWATER PIPELINES OF THE WORLD

Operator	Area	Field	Water Depth (meters)	Line Size (inch)	Status	Service	Length (Km)	Contractor	Vessel	Notes
Oman Oil Company	Arabian Sea	Oman to India Pipeline Project	3450	26	Design	Gas	1150			
Qatar-India	Arabian Sea	Dolphin	3000	24	Design		970			
Shell	GOM	Miss. Canyon Blk 657 Coulomb subsea wells	2300	8	Planned	Gas	40			
Total Fina Elf	GOM	Miss. Canyon Blk 305 Aconcagua Subsea wells	2150	12	Planned	Gas	90	Allseas	Lorelay	
GazProm	Black Sea	Blue Stream Project	2100	24	Planned	Gas	370	Saipem	S7000	
Shell	GOM	Miss. Canyon Blk 522 Fourier Subsea wells	2100		Planned	Gas	20			
Shell	GOM	Miss. Canyon Blk 520 Herschel Subsea wells	2050		Planned	Oil	15			Pipe-in-Pipe
BP Amoco	GOM	Desoto Canyon Blk 177 Kings peak subsea wells	2000		Design	Gas /Cond.				
Shell	GOM	Miss. Canyon Blk 607 East Anstey Subsea wells	2000		Planned	Gas	16			Pipe–in-Pipe
Shell	GOM	Miss. Canyon Blk 474 Nakika FPS Semi	1900	18	Planned	Oil				
Shell	GOM	Miss. Canyon Blk 474 Nakika FPS Semi	1900	20/24	Planned	Gas				
Shell	GOM	Miss. Canyon Blk 429, 385 Ariel Subsea wells	1900		Planned	Oil	8			
Petrobras	Brazil	RO-9 wellhead	1800	6	Planned	Oil	10	CSO	Sunrise 2000	Flexible Pipeline
Shell	GOM	Miss. Canyon Blk 383 Kepler Subsea wells	1750		Planned	Oil	16			Pipe-in-Pipe
Shell	GOM	Miss. Canyon Blk 687	1650	8	Installed	Gas	7	Allseas	Lorelay	
Shell	GOM	Miss. Canyon Blk 685 Mensa subsea PLEM	1650	12	Installed	Oil	105			

DEEPWATER PIPELINES OF THE WORLD

BP Amoco	GOM	Miss. Canyon Blk 84 King subsea wells	1650	8	Planned	Oil	30	Allseas	Solitaire	8" x 12"
Vastar	GOM	Miss. Canyon Blk 127Horn Mountain Sp.	1650	10	Planned	Gas	70	Saibos	Saibos FDS	
Vastar	GOM	Miss. Canyon Blk 127Horn	1650	12	Planned	Oil	60			
Shell	GOM	Miss. Canyon Blk 685 Mensa subsea PLEM	1600	3	Installed	Glycol	100	Global Industries	Chickasaw	
ExxonMobil	GOM	Alaminos Canyon Blk 26	1450	18	Installed	Gas	140	Allseas	Lorelay	
ExxonMobil	GOM	Alaminos Canyon Blk 26 Hoover field FPS	1450	18	Installed	Oil	120	Allseas	Solitaire	
ExxonMobil	GOM	EB Blk 946 Diana Subsea wells	1400	10	Installed	Oil	4	Saipem	S7000	
ExxonMobil	GOM	EB Blk 945 Diana Subsea wells	1400	6	Installed	Oil	28	Saipem	S7000	J Lay
Elf Angola	West Africa	Blk 17 Girassol subsea manifolds	1400	8	Planned	Oil	7	Alto Mar Girassol	Seaway Eagle	
ExxonMobil	GOM	EB Blk 949 Marshall Subsea wells	1400	6	Planned		12	Allseas	Lorelay	Pipe-in-Pipe
ExxonMobil	GOM	Alaminos Canyon Blk 24 Madison Subsea Wells	1400	6	Planned		12	Allseas	Lorelay	Pipe-in-Pipe
Petrobras	Brazil	Roncador Field FPS Semi P-36	1350	4	Planned	Gas Lift	10	DSND	Skandi Navic	
Petrobras	Brazil	Roncador Field FPS Semi P-36	1350	4	Planned	Gas Lift	12	DSND	Skandi Navic	
Petrobras	Brazil	Roncador Field FPS Semi P-36	1350	4	Planned	Gas Lift	12	DSND	Skandi Navic	
Texaco	West Africa	Agbami	1350	8/12	Planned					
Petrobras	Brazil	Roncador Field FPS Semi P-36 Sana	1300	10	Installed	Gas	4	DSND Consub	Fennica	
ExxonMobil	GOM	Miss. Canyon Blk 211 Mica subsea wells	1300	8	Planned	Prod.	49	Allseas	Lorelay	One of the two pipelines
Shell	GOM	Miss. Canyon Blk 899	1300	12	Planned		16	J Ray	DB 50	8" x 12"

DEEPWATER PIPELINES OF THE WORLD

Petrobras	Brazil	Roncador Field FPS Semi P-36 Sana	1250	10	Installed	Oil	10	DSND Consub	Fennica	
Shell	GOM	Miss. Canyon Blk 764 Ursa subsea wells	1200	18	Installed	Oil	5	J Ray McDermott	DB 50	

APPENDIX 3 - HEEREMA INFORMATION

MARINE CONTRACTORS

Fax *message*

Heerema Marine Contractors Nederland B.V.

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From R.R. Narold - Sales & Business Development

Date 15 May 2002

To INTEC Egis Consulting
Attn. David Raby
Fax 00 61 8 9220 9442

Project Timor Deep Water Pipeline -
File ref. feasibility Timor
Subject J-lay feasibility

Dear David,

MARINE CONTRACTORS

15 May 2002

The required static laytension necessary to install a 28"pipeline in 3000 m water depth is around 950 mt, thus within the Balder tension capacity of 1050 mt. Therefore we suggest to stick to the deepwater route instead of going shallower.

For the 10" domestic option, we have calculated lay tensions of about 220 mt at the deepest section.

A 30" pipeline would increase the laytension to some 1100 mt, and is therefore not preferable.

Please let me know if this information is in line with your requirements and do contact me again if any questions remain.

Yours faithfully
Heerema Marine Contractors Nederland B.V.

R.R. Narold

2 of 2

Internal copy: Peter van der Graaf

APPENDIX 4 - COSTING SHEETS

COST BREAKDOWN FOR 28" OUTSIDE DIAMETER OPTION 1

Pipeline Diameter	28	inches	
Wall Thickness	multiple	mm	
Coating Thickness	FBE		
Installation Method	Lay Barge	J Lay	
Line Length	230	Km	From Bayu to Suai

COST ITEM	RATE US$		AMOUNT		COST US$	AREA TOTAL US$
1.0 Materials & Transportation						
1.1 Heavy Wall Pipe/Corrosion Coating	1355	Tonne	40,733	tonne	55,193,215	
1.2 Standard Wall Pipe/Corrosion Coating	1355	Tonne	81,351	tonne	110,230,605	
1.3 Material transport	1.00	$/m	230,000	m	230,000	
1.4 Spoolpieces	100,000	$ each	1	off	100,000	
1.5 Anodes	450	$ each	1,916	off	862,200	
1.6 Riser	200,000	$ each	1		200,000	
						$166,816,020
2.0 Shore Approach						
2.1 Land fall	28,000,000	$	1		28,000,000	
2.2 Trenching/Stabilisation	12,000,000	$ each	1		12,000,000	
						$40,000,000
3.0 Route Survey						
3.1 pre survey vessel	12,000	$/day	90.0	days	1,080,000	
						$1,080,000
4.0 Offshore Installation						
4.1 DSV	100,000	$/day	30.00	days	3,000,000	
4.2 laybarge	550,000	$/day	77.0	days	42,350,000	
						$45,350,000
5.0 Mobilisation / Demobilisation						
5.1 Pre survey vessel	150,000	$	1		150,000	
5.2 DSV	750,000	$	1		750,000	
5.3 Laybarge	12,500,000	$	1		12,500,000	
						$13,400,000
			SUB TOTAL - DIRECT COSTS			**$266,646,020**
6.0 Indirect Costs						
6.1 Engineering & Project Mangt.(1.0-5.0)	4.0%		266,646,020		10,665,841	
6.2 Procurement (1.3 - 1.6)	10.0%		1,392,200		139,220	
6.3 Inspection (1.3 - 1.6)	6.0%		1,392,200		83,532	
6.4 Supervision (2.0-4.0)	4.0%		86,430,000		3,457,200	
6.5 Insurance (2.0-5.0)	4.0%		99,830,000		3,993,200	
						$18,338,993
7.0 Contingencies						
7.1 Materials (1.0)	10.0%		166,816,020		16,681,602	
7.2 Shore Approach (2.0)	15.0%		40,000,000		6,000,000	
7.3 Route Survey (3.0)	10.0%		1,080,000		108,000	
7.3 Offshore (4.0)	12.5%		45,350,000		5,668,750	
7.4 Mobilisation / Demobilisation (5.0)	10.0%		13,400,000		1,340,000	
7.5 Indirect Costs (6.0)	10.0%		18,338,993		1,833,899	
						$31,632,251
			SUB TOTAL - INDIRECT COSTS			**$49,971,244**
			TOTAL FOR PIPELINE			**$316,617,264**

COST BREAKDOWN FOR 10" OUTSIDE DIAMETER OPTION 2

Pipeline Diameter	10	inches	
Wall Thickness	multiple	mm	
Coating Thickness	FBE		
Installation Method	Lay Barge	J Lay	
Line Length	230	Km	From Bayu to Suai

COST ITEM	RATE US$	AMOUNT	COST US$	AREA TOTAL US$
1.0 Materials & Transportation				
1.1 Heavy Wall Pipe/Corrosion Coating	1355 Tonne	8,792 tonne	11,913,160	
1.2 Standard Wall Pipe/Corrosion Coating	1355 Tonne	13,324 tonne	18,054,020	
1.3 Material transport	1.00 $/m	230,000 m	230,000	
1.4 Spoolpieces	75,000 $ each	1 off	75,000	
1.5 Anodes	300 $ each	1,916 off	574,800	
1.6 Riser	150,000 $ each	1	150,000	
				$30,996,980
2.0 Shore Approach				
2.1 Land fall	25,000,000 $	1	25,000,000	
2.2 Trenching/Stabilisation	8,000,000 $ each	1	8,000,000	
				$33,000,000
3.0 Route Survey				
3.1 pre survey vessel	12,000 $/day	90.0 days	1,080,000	
				$1,080,000
4.0 Offshore Installation				
4.1 DSV	100,000 $/day	30.00 days	3,000,000	
4.2 laybarge	550,000 $/day	58.0 days	31,900,000	
				$34,900,000
5.0 Mobilisation / Demobilisation				
5.1 Pre survey vessel	150,000 $	1	150,000	
5.2 DSV	750,000 $	1	750,000	
5.3 Laybarge	12,500,000 $	1	12,500,000	
				$13,400,000
		SUB TOTAL - DIRECT COSTS		**$113,376,980**
6.0 Indirect Costs				
6.1 Engineering & Project Mangt.(1.0-5.0)	4.0%	113,376,980	4,535,079	
6.2 Procurement (1.2 - 1.6)	10.0%	19,083,820	1,908,382	
6.3 Inspection (1.2 - 1.6)	6.0%	19,083,820	1,145,029	
6.4 Supervision (2.0-4.0)	4.0%	68,980,000	2,759,200	
6.5 Insurance (2.0-5.0)	4.0%	113,376,980	4,535,079	
				$14,882,770
7.0 Contingencies				
7.1 Materials (1.0)	10.0%	30,996,980	3,099,698	
7.2 Shore Approach (2.0)	15.0%	33,000,000	4,950,000	
7.3 Route Survey (3.0)	10.0%	1,080,000	108,000	
7.3 Offshore (4.0)	12.5%	34,900,000	4,362,500	
7.4 Mobilisation / Demobilisation (5.0)	10.0%	13,400,000	1,340,000	
7.5 Indirect Costs (6.0)	10.0%	14,882,770	1,488,277	
				$15,348,475
		SUB TOTAL - INDIRECT COSTS		**$30,231,245**
		TOTAL FOR PIPELINE		**$143,608,225**

COST BREAKDOWN FOR 28" OUTSIDE DIAMETER OPTION 3

Pipeline Diameter	28	inches	
Wall Thickness	single	mm	
Coating Thickness	FBE		
Installation Method	Lay Barge	J Lay	
Line Length	220	Km	From Greater Sunrise to Bayu Undan

COST ITEM	RATE US$	AMOUNT	COST US$	AREA TOTAL US$
1.0 Materials & Transportation				
1.1 Pipe/Corrosion Coating	1355 Tonne	71,280 tonne	96,584,400	
1.2 Concrete Coating	150 Tonne	80,210 tonne	12,031,500	
1.3 Material transport	1.00 $/m	220,000 m	220,000	
1.4 Spoolpieces	100,000 $ each	2 off	200,000	
1.5 Anodes	450 $ each	1,833 off	824,850	
1.6 Riser	200,000 $ each	2	400,000	
				$110,260,750
2.0 Shore Approach				
2.1 Land fall	28,000,000 $	0	0	
2.2 Trenching/Stabilisation	12,000,000 $ each	0	0	
				$0
3.0 Route Survey				
3.1 pre survey vessel	12,000 $/day	70.0 days	840,000	
				$840,000
4.0 Offshore Installation				
4.1 DSV	100,000 $/day	30.00 days	3,000,000	
4.2 laybarge	300,000 $/day	55.0 days	16,500,000	
				$19,500,000
5.0 Mobilisation / Demobilisation				
5.1 Pre survey vessel	150,000 $	1	150,000	
5.2 DSV	750,000 $	1	750,000	
5.3 Laybarge	10,000,000 $	1	10,000,000	
				$10,900,000
		SUB TOTAL - DIRECT COSTS		**$141,500,750**
6.0 Indirect Costs				
6.1 Engineering & Project Mangt.(1.0-5.0)	4.0%	141,500,750	5,660,030	
6.2 Procurement (1.2 - 1.6)	10.0%	13,676,350	1,367,635	
6.3 Inspection (1.2 - 1.6)	6.0%	1,644,850	98,691	
6.4 Supervision (2.0-4.0)	4.0%	20,340,000	813,600	
6.5 Insurance (2.0-5.0)	4.0%	141,500,750	5,660,030	
				$13,599,986
7.0 Contingencies				
7.1 Materials (1.0)	10.0%	110,260,750	11,026,075	
7.2 Shore Approach (2.0)	15.0%	0	0	
7.3 Route Survey (3.0)	10.0%	840,000	84,000	
7.3 Offshore (4.0)	12.5%	19,500,000	2,437,500	
7.4 Mobilisation / Demobilisation (5.0)	10.0%	10,900,000	1,090,000	
7.5 Indirect Costs (6.0)	10.0%	13,599,986	1,359,999	
				$15,997,574
		SUB TOTAL - INDIRECT COSTS		**$29,597,560**
		TOTAL FOR PIPELINE		**$171,098,310**