

TABLES OF CONTENTS

NON TECHNICAL SUMMARY

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

PREAMBLE

1	INTRODUCTION	1-1
1.1	<i>The Purpose and Scope of the Environmental Impact Statement.....</i>	<i>1-1</i>
1.1.1	The Proposed Development.....	1-2
1.2	<i>Scoping of the Environmental Impact Assessment.....</i>	<i>1-2</i>
1.3	<i>Surveys and Predictive Techniques</i>	<i>1-6</i>
1.4	<i>Data Limitations.....</i>	<i>1-7</i>
1.5	<i>Format of the Environmental Impact Statement.....</i>	<i>1-7</i>
1.5.1	Receiving Environment.....	1-7
1.5.2	Characteristics of the Proposed Development	1-8
1.5.3	Potential Impact of the Proposed Development	1-8
1.5.4	Do-Nothing Scenario.....	1-8
1.5.5	Mitigation Measures	1-8
1.5.6	Predicted Impact of the Proposed Development	1-8
1.5.7	Monitoring.....	1-8
1.5.8	Reinstatement and Residual Impacts	1-8
1.6	<i>Assessment of Impacts.....</i>	<i>1-9</i>
1.7	<i>Legislative Requirements.....</i>	<i>1-10</i>
1.7.1	European Legislation.....	1-10
1.7.2	National Legislation.....	1-10
1.8	<i>Statutory Approvals.....</i>	<i>1-11</i>
2.	DESCRIPTION OF THE PROPOSED DEVELOPMENT	2-1
2.1	<i>Site Context.....</i>	<i>2-1</i>
2.2	<i>Proposed Development</i>	<i>2-1</i>
2.2.1	Development History.....	2-1
2.2.2	Corrib Field.....	2-3
2.2.3	Pipeline.....	2-3
2.2.4	Umbilical	2-4
2.2.5	Discharge Pipeline.....	2-4
2.2.6	Landfall Facilities.....	2-4
2.3	<i>Project Layout.....</i>	<i>2-4</i>
2.3.1	Corrib Field.....	2-4

2.3.2 Pipeline and Umbilical Route.....	2-7
2.3.3 Landfall	2-8
2.4 <i>Drilling</i>	2-8
2.5 <i>Facilities Design</i>.....	2-13
2.5.1 Wellheads	2-13
2.5.2 Central Subsea Facilities.....	2-13
2.5.3 Gas Pipeline and Control Umbilical.....	2-15
2.5.4 Discharge Pipeline.....	2-17
2.6 <i>Process Description</i>.....	2-18
2.6.1 Well Fluids.....	2-18
2.7 <i>Control and Protection Systems</i>	2-19
2.7.1 Wellhead Control	2-19
2.7.2 Seabed Facilities Protection	2-20
2.7.3 System Safety	2-24
2.7.4 Summary	2-24
2.8 <i>Decommissioning</i>	2-25
3. CONSTRUCTION	3-1
3.1 <i>Construction Strategy</i>.....	3-1
3.2 <i>Project Management and Control</i>.....	3-1
3.3 <i>Drilling</i>	3-1
3.3.1 MODU and Support Vessel.....	3-3
3.3.2 Completion of Suspended Wells	3-3
3.4 <i>Offshore Installation General</i>.....	3-3
3.4.1 Schedule of Operations.....	3-3
3.4.2 Safety and Environment Management	3-5
3.4.3 Subsea Construction	3-5
3.4.4 Seabed Preparation.....	3-6
3.5 <i>Installation of Field Facilities</i>	3-6
3.5.1 Wellheads	3-6
3.5.2 Production and Pipeline End Manifolds	3-7
3.5.3 Infield Flowlines and Umbilicals.....	3-7
3.6 <i>Installation of Pipeline and Umbilicals</i>.....	3-7
3.6.1 Introduction	3-7
3.6.2 Nearshore Pipeline and Landfall Preparation	3-8
3.6.3 Inshore Pipeline Construction	3-13
3.6.4 Offshore Pipeline Construction	3-14
3.6.5 Pipe Burial	3-16
3.6.6 Inshore Umbilical Construction	3-17
3.6.7 Offshore Umbilical Installation	3-18
3.7 <i>Estuary Crossings</i>.....	3-19
3.7.1 Pipeline and Umbilical	3-19

3.7.2 Pulling Loads.....	3-20
3.7.3 Installation.....	3-20
3.7.4 Onshore Block Valve and Termination Unit	3-23
4. ALTERNATIVES	4-1
4.1 Need for the Scheme.....	4-1
4.1.1 Energy Sources in Ireland	4-1
4.1.2 Need for the Field Facilities, Pipelines and Umbilical	4-2
4.2 Examination of Alternative Locations	4-4
4.2.1 Corrib Field.....	4-4
4.2.2 Terminal and Landfall	4-4
4.2.3 Offshore Pipeline Route	4-8
4.2.4 Discharge Pipeline.....	4-9
4.2.5 Sruwaddacon Crossings	4-10
4.3 Examination of Alternative Design	4-10
4.3.1 Corrib Field Facilities.....	4-10
4.3.2 Facilities, Pipelines and Systems.....	4-10
4.4 Examination of Alternative Processes.....	4-12
4.4.1 Options for Drilling.....	4-13
4.4.2 Options for Hydraulic Valve Control	4-15
4.4.3 Options for Hydrate Inhibitor.....	4-16
4.4.4 Options for Scale Prevention	4-17
4.4.5 Options for Corrosion Protection	4-20
4.4.6 Options for Treatment of Produced Water	4-20
4.5 Options for Construction/Installation	4-20
4.5.1 Offshore Installation of the Gas Pipeline	4-20
4.5.2 Landfall	4-21
4.5.3 Sruwaddacon Crossings	4-21
5 PLANNING AND DEVELOPMENT CONTEXT.....	5-1
5.1 General	5-1
5.2 Existing and Future Natural Gas Network	5-1
5.2.1 Current	5-1
5.2.2 Future.....	5-1
5.3 National Planning Context.....	5-2
5.3.1 Government Guidelines	5-2
5.3.2 European NUTS II Regions - Objective 1 and Objective 2	5-3
5.3.3 The National Development Plan 2000-2006.....	5-4
5.3.4 'National Investment Priorities for the Period 2000-2006' (ESRI) ...	5-4
5.3.5 Proposed National Spatial Strategy.....	5-5

5.4	<i>Regional Planning Context</i>	5-5
5.4.1	'The Border, Midlands and Western Region – Development Strategy 2000-2006'	5-5
5.5	<i>Local Statutory Development Plan Context</i>	5-6
5.5.1	Mayo County Development Plan, 1992	5-6
5.6	<i>Impact of the Development on Strategic National Planning and Regional Development</i>	5-7
5.7	<i>Impacts on Land Use</i>	5-8
5.8	<i>Summary</i>	5-9
6	HUMAN BEINGS	6-1
6.1	<i>Introduction</i>	6-1
6.2	<i>Study Methodology</i>	6-1
6.3	<i>Receiving Environment</i>	6-1
6.3.1	Population	6-1
6.3.2	Employment	6-2
6.3.3	Tourism	6-2
6.3.4	Language and Culture	6-3
6.4	<i>Characteristics of the Proposed Development</i>	6-4
6.4.1	Construction	6-4
6.4.2	Operation	6-4
6.5	<i>Predicted Impacts</i>	6-4
6.5.1	During Construction	6-4
6.5.2	During Operation	6-7
6.6	<i>Do-Nothing Scenario</i>	6-8
6.7	<i>Mitigation Measures</i>	6-8
6.7.1	Population, Language and Culture	6-8
6.7.2	Employment and Economic Impacts	6-9
6.7.3	Tourism	6-9
6.8	<i>Monitoring</i>	6-9
6.9	<i>Reinstatement and Residual Impacts</i>	6-9
7.	FLORA AND FAUNA	7-1
7.1	<i>Introduction</i>	7-1
7.2	<i>Study Methods</i>	7-1
7.2.1	Literature Review and Consultation	7-1
7.2.2	Baseline Marine Studies and Surveys	7-2
7.3	<i>Receiving Environment</i>	7-7
7.3.1	Offshore	7-7
7.3.2	Nearshore	7-22
7.3.3	Landfall and Sruwaddacon	7-30
7.3.4	Designated Conservation Areas along the Subsea Pipeline Route..	7-43

7.4 Characteristics of the Proposed Development.....	7-47
7.5 Potential Impacts of the Proposed Development	7-47
7.5.1 Potential Offshore Impacts of the Proposed Development.....	7-48
7.5.2 Potential Nearshore Impacts of the Proposed Development ...	7-52
7.5.3 Potential Impacts of the Proposed Development at the Landfall and Sruwaddacon Crossings.....	7-55
7.6 Do-Nothing Scenario	7-56
7.7 Mitigation Measures.....	7-56
7.7.1 Offshore Mitigation Measures.....	7-56
7.7.2 Nearshore Mitigation Measures.....	7-59
7.7.3 Landfall and Sruwaddacon Mitigation Measures	7-62
7.8 Predicted Impact of the Proposed Development	7-63
7.8.1 Predicted Offshore Impacts of the Proposed Development.....	7-63
7.8.2 Predicted Nearshore Impacts of the Proposed Development..	7-66
7.8.3 Predicted Impacts at the Landfall and Sruwaddacon Crossings	7-68
7.9 Monitoring	7-69
7.9.1 Corrib Field.....	7-69
7.9.2 Pipeline Route	7-70
7.9.3 Broadhaven Bay	7-70
7.10 Reinstatement and Residual Effects.....	7-73
7.10.1 Offshore Area	7-73
7.10.2 Nearshore Area.....	7-73
7.10.3 Landfall and Sruwaddacon	7-73
8. GEOLOGY AND SEDIMENTS	8-1
8.1 Introduction.....	8-1
8.2 Study Methods.....	8-1
8.3 Receiving Environment.....	8-3
8.3.1 Solid Geology.....	8-3
8.3.2 Regional /Tectonic Setting and Structural Evolution	8-4
8.3.3 Geology of Broadhaven Bay.....	8-7
8.3.4 Quaternary Geology and Superficial Sediments.....	8-8
8.4 Characteristics of the Proposed Development.....	8-27
8.4.1 Offshore	8-27
8.4.2 Nearshore	8-27
8.4.3 Landfall and Sruwaddacon Crossings.....	8-27
8.5 Potential Impacts of the Proposed Development	8-28
8.5.1 Seismic Surveys.....	8-28
8.5.2 Drilling	8-28
8.5.3 Field Facilities.....	8-29
8.5.4 Pipeline and Umbilical	8-29

8.5.5 Water Discharge Pipeline	8-30
8.6 <i>Do-Nothing Scenario</i>	8-30
8.7 <i>Mitigation Measures</i>	8-30
8.7.1 Seismic Surveys.....	8-30
8.7.2 Drilling	8-30
8.7.3 Field Facilities.....	8-31
8.7.4 Pipeline and Umbilical	8-31
8.7.5 Water Discharge Pipeline	8-31
8.8 <i>Predicted Impact of the Proposed Development</i>	8-31
8.8.1 Seismic Surveys.....	8-31
8.8.2 Drilling	8-31
8.8.3 Field Facilities.....	8-31
8.8.4 Pipeline and Umbilical	8-31
8.8.5 Water Discharge Pipeline	8-32
8.9 <i>Monitoring</i>	8-32
8.10 <i>Reinstatement and Residual Impacts</i>	8-32
8.10.1 Pipeline Presence	8-32
8.10.2 Structures Removal.....	8-32
9. WATER	9-1
9.1 <i>Introduction</i>	9-1
9.2 <i>Study Methods</i>	9-1
9.3 <i>Receiving Environment</i>	9-2
9.3.1 General Description	9-2
9.3.2 Oceanographic Conditions in the Corrib Field and Along the Pipeline Route	9-3
9.3.3 Stratification and Water Quality.....	9-9
9.4 <i>Characteristics of the Proposed Development</i>	9-18
9.5 <i>Potential Impacts of the Proposed Development</i>	9-18
9.5.1 Offshore	9-19
9.5.2 Pipeline and Umbilical	9-26
9.5.3 Waste Water Outfall.....	9-28
9.5.4 Landfall and Estuarine Works	9-35
9.6 <i>Do-Nothing Scenario</i>	9-35
9.7 <i>Mitigation Measures</i>	9-36
9.7.1 Offshore	9-36
9.7.2 Pipeline and Umbilical	9-38
9.7.3 Waste Water Outfall.....	9-38
9.7.4 Landfall and Estuarine Works	9-44
9.8 <i>Predicted Impact of the Proposed Development</i>	9-46
9.8.1 Offshore	9-46
9.8.2 Pipeline and Umbilical	9-47

9.8.3 Waste Water Outfall.....	9-48
9.8.4 Landfall and Estuarine Works	9-52
9.9 Monitoring	9-52
9.10 Reinstatement and Residual Impacts	9-53
10. AIR EMISSIONS	10-1
10.1 Introduction.....	10-1
10.2 Study Methodology.....	10-1
10.3 Receiving Environment.....	10-1
10.4 Characteristics of the Proposed Development.....	10-2
10.5 Potential Impacts of the Proposed Development	10-2
10.5.1 Description of Atmospheric Pollutants.....	10-2
10.5.2 Impacts	10-2
10.6 Do-Nothing Scenario	10-8
10.7 Mitigation Measures.....	10-8
10.7.1 Construction.....	10-8
10.7.2 Operations.....	10-8
10.8 Predicted Impact of the Proposed Development	10-8
10.9 Monitoring	10-10
10.10 Reinstatement and Residual Impacts	10-10
11 NOISE	11-1
11.1 Introduction.....	11-1
11.2 Study Methodology and Published Guidance	11-1
11.3 Receiving Environment.....	11-2
11.3.1 Offshore	11-2
11.3.2 Nearshore	11-4
11.3.3 Landfall and Sruwaddacon	11-4
11.4 Characteristics of the Proposed Development.....	11-7
11.4.1 Offshore	11-7
11.4.2 Nearshore	11-8
11.4.3 Landfall and Crossings.....	11-9
11.5 Potential Impacts	11-10
11.5.1 Offshore	11-10
11.5.2 Nearshore	11-12
11.5.3 Landfall and Crossings.....	11-16
11.6 Do-Nothing Scenario	11-18
11.7 Mitigation Measures.....	11-18
11.7.1 Drilling	11-18
11.7.2 Blasting	11-18
11.7.3 Other Mitigating Measures.....	11-22

11.8 Predicted Impacts	11-22
11.8.1 Offshore	11-22
11.8.2 Nearshore	11-23
11.8.3 Landfall and Crossings.....	11-24
11.9 Monitoring.....	11-25
11.10 Reinstatement and Residual Impacts.....	11-25
12. LANDSCAPE AND VISUAL IMPACT.....	12-1
12.1 Introduction	12-1
12.2 Study Methodology	12-1
12.3 Receiving Environment.....	12-2
12.3.1 Offshore	12-2
12.3.2 Nearshore	12-2
12.3.3 Landfall and Sruwaddacon Estuary	12-3
12.4 Characteristics of the Proposed Development.....	12-3
12.4.1 Drilling	12-3
12.4.2 Field Facilities.....	12-4
12.4.3 Pipeline, Umbilical and Discharge Pipeline	12-4
12.5 Potential Impacts of the Proposed Development	12-4
12.5.1 Offshore	12-4
12.5.2 Nearshore	12-4
12.5.3 Landfall and Sruwaddacon.....	12-4
12.6 Do-Nothing Scenario.....	12-5
12.7 Mitigation Measures	12-5
12.7.1 Offshore	12-5
12.7.2 Nearshore	12-5
12.7.3 Landfall and Sruwaddacon.....	12-5
12.8 Predicted Impact of the Proposed Development	12-6
12.8.1 Offshore	12-6
12.8.2 Nearshore	12-6
12.8.3 Landfall and Sruwaddacon.....	12-6
12.9 Monitoring.....	12-6
12.10 Reinstatement and Residual Impacts.....	12-6
13. CLIMATIC IMPACT	13-1
13.1 Introduction	13-1
13.2 Study Methodology	13-1
13.3 Receiving Environment.....	13-1
13.4 Characteristics of Proposed Development.....	13-1
13.4.1 Construction.....	13-1
13.4.2 Operations.....	13-2
13.4.3 Decommissioning	13-2

13.5 Potential Impact of the Proposed Development	13-2
13.6 Do Nothing Scenario.....	13-3
13.7 Mitigation Measures.....	13-3
13.8 Predicted Impact of the Proposed Development	13-3
13.8.1 Global Warming Potential.....	13-3
13.8.2 Photochemical Ozone Creation Potential (POCP)	13-4
13.9 Monitoring.....	13-6
13.10 Reinstatement and Residual Impacts	13-6
 14. CULTURAL HERITAGE	 14-1
14.1 Introduction.....	14-1
14.1.1 Legislative Requirements.....	14-1
14.2 Study Methods.....	14-2
14.2.1 Desktop Survey	14-2
14.2.2 Intertidal Survey	14-2
14.2.3 Geophysical Investigations	14-2
14.3 Receiving Environment.....	14-4
14.3.1 Offshore	14-4
14.3.2 Nearshore	14-5
14.3.3 Landfall	14-5
14.3.4 Sruwaddacon	14-6
14.4 Characteristics of the Proposed Development.....	14-7
14.4.1 Construction and Operation	14-7
14.5 Potential Impact of the Proposed Development	14-7
14.6 Do-Nothing Scenario	14-8
14.7 Mitigation Measures.....	14-8
14.8 Predicted Impact of the Proposed Development	14-8
14.9 Monitoring	14-8
14.10 Reinstatement and Residual Effects	14-9
 15. MATERIAL ASSETS	 15-1
15.1 Introduction.....	15-1
15.2 Solid Waste.....	15-1
15.2.1 Introduction	15-1
15.2.2 Study Methodology.....	15-1
15.2.3 Receiving Environment	15-1
15.2.4 Characteristics of the Proposed Development	15-3
15.2.5 Potential Impacts of the Proposed Development.....	15-3
15.2.6 Do-Nothing Scenario.....	15-7
15.2.7 Mitigation Measures	15-7
15.2.8 Predicted Impacts of the Proposed Development.....	15-8
15.2.9 Monitoring.....	15-10

15.2.10	Reinstatement and Residual Effects	15-10
15.3	Traffic Impact Assessment	15-10
15.3.1	Introduction	15-10
15.3.2	Study Methodology.....	15-11
15.3.3	Receiving Environment	15-11
15.3.4	Characteristics of the Proposed Development	15-13
15.3.5	Potential Impact of the Proposed Development	15-14
15.3.6	Do-Nothing Scenario.....	15-16
15.3.7	Mitigation Measures.....	15-17
15.3.8	Predicted Impact of the Proposed Development	15-19
15.3.9	Monitoring.....	15-20
15.3.10	Reinstatement and Residual Effects	15-20
16.	ASSESSMENT OF ENVIRONMENTAL EFFECTS	16-1
<i>16.1</i>	<i>Introduction</i>	<i>16-1</i>
<i>16.2</i>	<i>Evaluation of Relative Ecological Significance</i>	<i>16-2</i>
<i>16.3</i>	<i>Accidental Events.....</i>	<i>16-23</i>
16.3.1	The Environmental Risk Assessment Process	16-23
16.3.2	Assessment of Non-Routine Events.....	16-23
17.	INDIRECT and CUMULATIVE IMPACTS and IMPACT INTERACTIONS	17-1
<i>17.1</i>	<i>Introduction</i>	<i>17-1</i>
<i>17.2</i>	<i>Characteristics of the Proposed Development.....</i>	<i>17-1</i>
<i>17.3</i>	<i>Study Methodology</i>	<i>17-2</i>
<i>17.4</i>	<i>Predicted Cumulative Impacts of the Proposed Development.....</i>	<i>17-2</i>
17.4.1	Impact Interactions and Indirect Impacts.....	17-2
17.4.2	Cumulative Impacts.....	17-4
18	ENVIRONMENTAL MANAGEMENT	18-1
<i>18.1</i>	<i>Introduction</i>	<i>18-1</i>
<i>18.2</i>	<i>General Environmental Standards</i>	<i>18-1</i>
<i>18.3</i>	<i>Drilling Discharges and Waste Management</i>	<i>18-2</i>
<i>18.4</i>	<i>Construction and Presence of Infrastructure and Pipeline.....</i>	<i>18-3</i>
18.4.1	Operational Discharges.....	18-4
18.4.2	Oil Spill Contingency Planning.....	18-4
18.4.3	Traffic Management	18-5
18.4.4	Noise Control.....	18-6
18.4.5	Decommissioning	18-6
<i>18.5</i>	<i>Monitoring Commitments.....</i>	<i>18-7</i>
<i>18.6</i>	<i>Auditing and Reporting Strategy.....</i>	<i>18-7</i>

19. THE ONSHORE PIPELINE ROUTE.....19-1

GLOSSARY OF TECHNICAL TERMS

REFERENCES

LIST OF APPENDICES

LIST OF TABLES

Table 2.1: Wellhead Protection, PLEM and Manifold dimensions and weights..	2-14
Table 2.2: Results of Gas Analysis from a typical Corrib well test.....	2-18
Table 4.1: Comparison of Hydrate Inhibitors.....	4-18
Table 5.1: Mayo County Development Plan 1992 - Maps 1-12, Infrastructure, Resources and Development Control Objectives.....	5-7
Table 7.1: Range of statistics from the 27 Stations within the Corrib Field	7-9
Table 7.2: Average weight of commercial demersal species in Marine Institute trawls at ten stations.....	7-16
Table 7.3: Seabird species and their vulnerability to oil pollution in the vicinity of the Corrib Field	7-19
Table 7.4: Cetacean species recorded off north-west Mayo (adapted from Berrow, 2000)	7-21
Table 7.5: Catch data for landings at various ports in the vicinity of Broadhaven Bay for 1998, compiled by DOMNR	7-24
Table 7.6: Fish species recorded by the Marine Institute in Broadhaven Bay 1993-2000 (no trawl in 1996). Figures in brackets represent the weight fraction of the average catch by individual species.....	7-25
Table 7.7: The species recorded and their abundance (m-2), from the core samples taken at the Upstream Crossing Point.....	7-39
Table 7.8: The protection status of a number of migratory fish species	7-41
Table 7.9: Sruwaddacon Bay – winter count 1999.....	7-42
Table 7.10: Sruwaddacon Bay IWeBS counts Sept.2000 – Feb 2001 (courtesy of Dúchas)	7-43
Table 7.11: Site names of Special Areas of Conservation (SAC) and candidate SACs shown in Figure 7.15	7-45
Table 7.12: Comparison of sounds produced by main baleen and toothed whale species in the Eastern Atlantic area with drilling noise (Richardson et al., 1995)	7-50
Table 8.1: Description of the stratigraphy for Corrib Field.....	8-6
Table 8.2: Summary of drilling activities and subsequent environmental sampling in the Corrib Field	8-24
Table 9.1: Exposure of Broadhaven Bay to waves from various directions.....	9-5
Table 9.2: Significant wave heights (m) for different return periods at four points along the Corrib pipeline	9-6
Table 9.3: Current speeds (cm/s) for different return periods at four points along the Corrib pipeline at 1.0 m above seabed.....	9-7
Table 9.4: Extreme storm surge heights (m) for different return periods at three points along the Corrib pipeline route	9-9
Table 9.5: Extreme total water levels (m) for different return periods at three points along the Corrib pipeline route	9-9
Table 9.6: Estimated annual loads of 4 metals over 1990-1996 for the principal rivers discharging into the Atlantic.....	9-11
Table 9.7: Estimated annual loads of total nitrogen and total phosphorus over the period 1990–1996 for the principal rivers discharging into Irish marine areas	9-14

Table 9.8: Total annual inputs of various metals from the atmosphere and precipitation.....	9-15
Table 9.9: Approximate annual atmospheric inputs of various nutrients into the Atlantic zone west of Ireland	9-15
Table 9.10: Estimates on the annual input of organic contaminants into the Atlantic zone west of Ireland	9-16
Table 9.11: Background concentrations for five key metals in the Ocean, Offshore and Estuarine Environments (OSPAR, 2000 Region III QSR)	9-17
Table 9.12: Measured background metal concentrations in Broadhaven Bay.	9-17
Table 9.13: Domestic liquid waste water discharges for the future wells	9-20
Table 9.14: Typical drilling fluid and cuttings discharges by hole interval for three future wells	9-21
Table 9.15: Estimated drilling fluid chemicals discharge for the three future wells ...	9-21
Table 9.16: Estimated cement slurry and drilled solids discharges for the three future wells	9-24
Table 9.17: Black and grey water and galley waste production estimate during Field facilities and pipeline and umbilical installation.....	9-25
Table 9.18: Typical composition of sacrificial anodes	9-28
Table 9.19: Produced water compositions	9-33
Table 9.20: Water flow rates.....	9-34
Table 9.21: Maximum annual contaminant loading of the waste water in year 2..	9-49
Table 10.1: Estimated atmospheric emissions – drilling and testing.....	10-4
Table 10.2: Estimated emissions from the completion of suspended wells and the installation of subsea production equipment	10-4
Table 10.3: Estimated emissions from offshore pipelay and umbilical installation	10-5
Table 10.4: Estimated emissions from nearshore pipelaying	10-6
Table 10.5: Estimated emissions from the landfall and Sruwaddacon crossings	10-7
Table 10.6: Summary of emissions	10-9
Table 10.7: Comparison of emissions with other industrial sources.....	10-9
Table 11.1: Characteristics and levels of some key sources of underwater noise (Richardson et al., 1995)	11-2
Table 11.2: Typical Background noise levels at the closest properties to the proposed landfall and Sruwaddacon crossing sites	11-6
Table 11.3 Underwater noise signatures for vessels that could be present in Broadhaven Bay during installation activities.	11-9
Table 11.4: Noise emissions from typical onshore plant for landfall construction	11-16
Table 13.1: GWP emissions (CO ₂ equivalents)	13-3
Table 13.2: Comparison of GWP with Other Industrial Sources.....	13-4
Table 13.3: POCP emissions (ethylene equivalents)	13-5
Table 13.4: Comparison of POCP with Other Industrial Sources	13-5
Table 14.1: National maritime wreck inventory records from the Broadhaven Bay area	14-4
Table 15.1: European Waste Legislation.....	15-2

Table 15.2: Estimated cuttings for containment and shipping to shore from three future Corrib wells	15-4
Table 15.3: Solid Waste Production from Three Wells upon Drilling and Completion	15-5
Table 16.1: Criteria for assessing significance of effect.....	16-2
Table 16.2: Assessment of Potential Impacts, Proposed Mitigation Measures and Predicted Impacts	16-4
Table 16.3: Probability, response requirement / ecological consequence and risk categories used for assessment of the non-routine events.....	16-23
Table 16.4: Environmental risk assessment of the sources of effect associated with the key hazard scenarios identified for non-routine events for the Corrib drilling programme	16-25
Table 16.5: Summarised Environmental Risk Assessment	16-33
Table 17.1: Predicted cumulative impacts associated with the development of the Corrib Field	17-4
Table 18.1: Specific Monitoring/Recording and Reporting Requirements.....	18-7

LIST OF FIGURES

Figure 1.1: Location of the Corrib Field and subsea pipeline route	1-3
Figure 1.2: Location of the Corrib Pipeline landfall and Terminal.....	1-3
Figure 2.1: Depths to the reservoir from the seabed, and bottom-hole (target) locations of the wells drilled to date.....	2-2
Figure 2.2: Central field layout (satellite wells not shown)	2-5
Figure 2.3: Schematic drawing of the Corrib Field, with wellhead protection structure, PLEM and manifold shown scaled against each other (the remainder of the drawing is not to scale).....	2-6
Figure 2.4: Schematic diagram of vertical and deviated wells drilled into different parts of a typical reservoir.....	2-7
Figure 2.5: The casing plan for well 18/25-3 and future wells	2-10
Figure 2.6: Cross section of the Corrib umbilical	2-17
Figure 2.7: Proposed extent of concrete coating of pipeline and burial.....	2-23
Figure 3.1: Schedule of operations	3-4
Figure 3.2: Schematic of charge setting operations	3-12
Figure 4.1: Potential landfall areas.....	4-6
Figure 5.1: Existing and proposed Bord Gáis Eireann transmission network	5-2
Figure 7.1: Benthic sampling locations in the Corrib Field	7-3
Figure 7.2: Benthic sampling stations along the proposed pipeline route	7-4
Figure 7.3: Corrib Field Development Field Ecology	A0
Figure 7.4: Corrib Field Development Pipeline Route Ecological Survey.....	A0
Figure 7.5: Locations of landfall and upper and lower crossing points and shoreline invertebrate sampling locations from 2000.....	7-6
Figure 7.6: ICES rectangles around the west coast of Ireland	7-12
Figure 7.7: Catch data (tonnes) from ICES blocks in the vicinity of the Corrib Field and pipeline route	7-13

Figure 7.8: Areas of main demersal fishing activity (Jee Associates, 2000).....	7-14
Figure 7.9: Relative size catches for all seven commercial demersal species at ten sites fished by the Marine Institute.....	7-16
Figure 7.10: Average total catch data (kg/hr) from ten sites trawled annually by the Marine Institute	7-17
Figure 7.11: BioMar survey locations within Broadhaven Bay	7-23
Figure 7.12: Locations of licenced areas for shellfish cultivation in Broadhaven Bay	7-27
Figure 7.13: Locations and directions of shoreline photograph points.....	7-30
Figure 7.14: Main biotopes and habitats recorded from the Upstream Crossing site and core sampling locations (1-5). (Explanation of biotope classifications provided in Appendix 7.1).....	7-38
Figure 7.15: Nature Conservation Sites around Broadhaven Bay and the Mullet peninsula	7-44
Figure 8.1: Stratigraphic column of the Corrib Field area	8-2
Figure 8.2: Figure showing the tectonic evolution of the Corrib area.	8-6
Figure 8.3: Corrib Field Development Pipeline Route Geological Survey	A0
Figure 8.4: Iceberg plough marks between KP8 and KP13.5	8-10
Figure 8.5: Soils section through ploughmark (KP13.5) (Line 2AS0075).....	8-12
Figure 8.6: Route through "Cresswell Gap"	8-14
Figure 8.7: Plan view of proposed northern route (KP69 to KP76)	8-18
Figure 8.8: Rock outcrop along proposed northernroute (KP71 – KP 78)	8-19
Figure 8.9: Rock outcrop along proposed route (KP71.5) (Line 11N0075).....	8-20
Figure 8.10: Subcropping rock along northern route (Line 1200)	8-21
Figure 9.1: Bathymetry of the Irish Coast	9-2
Figure 9.2: NESS/NEXT grid points	9-5
Figure 9.3: Depth profiles of background concentrations of various metals in the Atlantic Ocean	9-13
Figure 9.4: Comparison of background metal concentrations in Broadhaven Bay and the proposed discharge, against their respective EQS levels at the point of discharge	9-50
Figure 9.5: Proposed location of end of outfall pipe.....	9-52
Figure 11.1: Baseline noise monitoring locations	11-6
Figure 11.2: Wave paths from underwater explosions	11-14
Figure 14.1: Peat layer in Broadhaven Bay, revealed by sub-bottom profiling....	A3
Figure 15.1: Important shipping ports around the coast of Ireland showing total cargo handled (millions of tonnes per year) in 1995 (Boelens et al., 1999)	15-12
Figure 15.2: Study Area Road Network.....	15-13
Figure 15.3: Recommended Routes to Construction Sites.....	15-19
Figure 17.1: Cumulative impacts associated with the development of the Corrib Field	17-2
Figure 17.2: Impact interactions associated with the Corrib Field Development....	17-3

LIST OF PLATES

Plate 3.1: Self-elevating platform to support underwater blasting operations..	3-10
Plate 3.2: Typical Pipelaying barge, Solitaire	3-15
Plate 3.3: The trenching machine "Digging Donald"	3-16
Plate 3.4: Typical inshore sediment "jetting" equipment.....	3-17
Plate 3.5: Umbilical lay vessel (Seaway Falcon).....	3-18
Plate 3.6: Typical dynamically positioned installation vessel (Seaway Eagle)...	3-18
Plate 7.1: Landfall Site – Mobile sand in the upper mid-shore looking east towards the dune systems	7-31
Plate 7.2: Landfall Site – Boulders and cobbles in the mid-shore with a dense coverage of ephemeral green algae	7-32
Plate 7.3: Landfall Site – Seabed consisting of coarse rippled sand with occasional shallow rocky outcrops	7-32
Plate 7.4: Lower Crossing Point, West Shore – Dense <i>Arenicola marina</i> casts on the lower and midshore	7.34
Plate 7.5: Lower Crossing Point, East Shore – Rocky shore characterized by the seaweed <i>Ascophyllum nodosum</i>	7-35
Plate 7.6: Lower Crossing – Rocky boulder bottom on western side of crossing	7-36
Plate 7.7: Lower Crossing – Coarse sandy bottom in center of channel	7-36
Plate 7.8: Lower Crossing – Steep rising boulder outcrop eastern side of crossing...	7-37
Plate 7.9: Upper Crossing Point – View of north shore showing consolidated sand and gravel with fucoid covered boulders on upper shore	7-38
Plate 7.10: Upper Crossing Point: fucoid covered boulders on upper shore	7-40

LIST OF APPENDICES

- Appendix 0.1: RSK Environment Ltd – Brief Summary of Services
- Appendix 0.2: Organisations Consulted during the Environmental Impact Assessment Process
- Appendix 0.3: Key Concerns Raised by the Consultees
- Appendix 2.1: Historical Activity in the Corrib Field
- Appendix 4.1: The Harmonised Offshore Chemical Notification Format (HOCNF) Scheme
- Appendix 7.1: Biotopes Identified from the Landfall and Crossing Locations
- Appendix 7.2: Descriptions of Biomar Sites in Broadhaven Bay
- Appendix 7.3: Intertidal Macrofaunal Abundance from the Landfall and Adjacent Sites
- Appendix 7.4: Synopses from Conservation Sites in the Broadhaven Bay Area
- Appendix 7.5: Specification for Broadhaven Bay Monitoring Surveys
- Appendix 7.6: Cetacean Species Sighted in the Vicinity of Broadhaven Bay
- Appendix 8.1: Corrib Field and Pipeline Route Sediment Physio-Chemical Data
- Appendix 9.1: Dispersion Modelling
- Appendix 9.2: Discharges to Water
- Appendix 9.3: Water Treatment Flowchart
- Appendix 10.1: Description of Atmospheric Pollutants
- Appendix 14.1: Marine Archaeology Report, as Submitted to Duchas