

This is the Third Edition of our definitive report of Libya's Oil and Gas Industry. This report contains **452 pages** and includes data on over 80 developed and undeveloped fields along with details of opportunities with pipelines, refineries and infrastructure.



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Table of Contents¹

Table of Contents.....	3
1 Executive Summary.....	11
1.1 OIL AND GAS INVENTORY	11
1.2 OIL AND GAS INDUSTRY	11
1.2.1 Overall	11
1.2.1.1 Status	11
1.2.1.2 Investment Requirements.....	17
1.2.2 Upstream.....	17
1.2.2.1 Oil.....	17
1.2.2.1.1 Status	17
1.2.2.1.2 Investment Requirement.....	18
1.2.2.2 Non-Associated Gas	19
1.2.2.2.1 Status	19
1.2.2.2.2 Investment Requirement.....	20
1.2.3 Midstream	20
1.2.3.1 Pipelines.....	20
1.2.3.1.1 Status	20
1.2.3.1.2 Investment Requirement.....	21
1.2.3.2 Crude Oil Terminals	22
1.2.3.2.1 Status	22
1.2.3.2.2 Investment Requirement.....	22
1.2.4 Downstream	23
1.2.4.1 Refineries.....	23
1.2.4.1.1 Status	23
1.2.4.1.2 Investment Requirement.....	23
1.2.4.2 Petrochemicals.....	24
1.2.4.2.1 Status	24
1.2.4.2.2 Investment Requirement.....	25
1.2.4.3 Gas Processing.....	25
1.2.4.3.1 Natural Gas Liquids.....	25
1.2.4.3.1.1 Status	25
1.2.4.3.1.2 Investment Requirement.....	26
1.2.4.3.2 Liquefied Natural Gas	26
1.2.4.3.2.1 Status	26
1.2.4.3.2.2 Investment Requirement.....	26
1.2.5 Infrastructure	27

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1.2.5.1 Transportation	27
1.2.5.1.1 Status	27
1.2.5.1.2 Investment Requirement	27
1.2.5.2 Power	27
1.2.5.2.1 Status	28
1.2.5.2.2 Investment Requirement	28
1.2.6 Local Contractor Capability	28
2 Oil and Gas Inventory	29
2.1 OVERALL	29
2.2 OIL	36
2.2.1 Sirte Basin	36
2.2.2 Ghadames Basin	38
2.2.3 Murzuk Basin	38
2.2.4 Offshore/Tripolitania Basin	39
2.2.5 Cyrenaica	39
2.2.6 Kufra Basin	40
2.3 NON-ASSOCIATED GAS	41
2.3.1 Sirte Basin	41
2.3.2 Ghadames Basin	42
2.3.3 Murzuk Basin	42
2.3.4 Offshore/Tripolitania Basin	43
2.3.5 Cyrenaica	43
2.3.6 Kufra Basin	44
2.4 LICENSING	44
2.4.1 EPSA IV	45
EPSA IV Terms	46
Winner Selection	48
EPSA IV Management	48
2.4.2 Law No. 5	48
3 Oil and Gas Industry	49
3.1 UPSTREAM	49
3.1.1 Oil	50
3.1.1.1 Production History	50
3.1.1.2 Sirte Basin	53
3.1.1.2.1 Producing Fields	53
3.1.1.2.1.1 Abu Maras	60
3.1.1.2.1.2 Ali	63
3.1.1.2.1.3 Almas	65
3.1.1.2.1.4 Amal	67
3.1.1.2.1.5 Antlat	70
3.1.1.2.1.6 Arbab	72

3.1.1.2.1.7 As-Sarah.....	74
3.1.1.2.1.8 Bahi	77
3.1.1.2.1.9 Balat	80
3.1.1.2.1.10 Beda	82
3.1.1.2.1.11 Bu Alawn	85
3.1.1.2.1.12 Bu Attifel.....	87
3.1.1.2.1.13 Dahra	90
3.1.1.2.1.14 Defa.....	93
3.1.1.2.1.15 Ed Dib	96
3.1.1.2.1.16 El-Meheiriga.....	99
3.1.1.2.1.17 En Naga.....	101
3.1.1.2.1.18 Facha	104
3.1.1.2.1.19 Farrud	106
3.1.1.2.1.20 Fidda.....	108
3.1.1.2.1.21 Ghani	110
3.1.1.2.1.22 Gialo.....	113
3.1.1.2.1.23 Hamid.....	116
3.1.1.2.1.24 Hofra	119
3.1.1.2.1.25 Intisar	122
3.1.1.2.1.26 Kotla.....	125
3.1.1.2.1.27 Lehib / Dor Marada	127
3.1.1.2.1.28 Mabruk.....	130
3.1.1.2.1.29 Messla	133
3.1.1.2.1.30 Nafoora.....	136
3.1.1.2.1.31 Nakhla	139
3.1.1.2.1.32 Nasser (Formerly Zelten)	142
3.1.1.2.1.33 Qusur	145
3.1.1.2.1.34 Raguba.....	147
3.1.1.2.1.35 Rakb	150
3.1.1.2.1.36 Rimal-Khatib.....	153
3.1.1.2.1.37 Sabah.....	156
3.1.1.2.1.38 Safsaf.....	159
3.1.1.2.1.39 Sahabi.....	161
3.1.1.2.1.40 Samah.....	164
3.1.1.2.1.41 Sarir Group.....	167
3.1.1.2.1.42 Shatirah	170
3.1.1.2.1.43 Tibisti	172
3.1.1.2.1.44 Tuama.....	175
3.1.1.2.1.45 Umm Al Farrud	178
3.1.1.2.1.46 Wadi.....	179
3.1.1.2.1.47 Waha	182
3.1.1.2.1.48 Zaggut	185
3.1.1.2.1.49 Zella	188

3.1.1.2.1.50 Zenad.....	190
3.1.1.2.1.51 Other Producing Fields.....	193
3.1.1.2.2 Non-producing Fields.....	195
3.1.1.2.2.1 Abu Quray	200
3.1.1.2.2.2 Beda South	202
3.1.1.2.2.3 En Naga A	203
3.1.1.2.2.4 Other Non-Producing Fields.....	206
3.1.1.2.3 Exploration Potential	208
3.1.1.2.3.1 Activities	209
3.1.1.2.3.2 Investment Requirement.....	215
3.1.1.3 Ghadames Basin	216
3.1.1.3.1 Producing Fields.....	216
3.1.1.3.1.1 Hamada Group	218
3.1.1.3.1.2 Al Kabir Group.....	221
3.1.1.3.2 Non-producing Fields.....	224
3.1.1.3.2.1 Northern Group	226
3.1.1.3.2.2 Area 47 Group.....	228
3.1.1.3.3 Exploration Potential	235
3.1.1.3.3.1 Activities	236
3.1.1.3.3.2 Investment Requirement.....	239
3.1.1.4 Murzuk Basin.....	241
3.1.1.4.1 Producing Fields.....	241
3.1.1.4.1.1 Elephant.....	243
3.1.1.4.1.2 El Sharara (NC 115 fields)	246
3.1.1.4.1.3 NC 186 fields	249
3.1.1.4.2 Non-producing Fields.....	252
3.1.1.4.2.1 NC 101 Fields.....	254
3.1.1.4.3 Exploration Potential	256
3.1.1.4.3.1 Activities	257
3.1.1.4.3.2 Investment Requirement.....	259
3.1.1.5 Offshore / Tripolitania Basin	260
3.1.1.5.1 Producing Fields.....	260
3.1.1.5.1.1 Bouri.....	262
3.1.1.5.1.2 Al Jurf	265
3.1.1.5.2 Non-producing Fields.....	267
3.1.1.5.2.1 Small Undeveloped Fields.....	269
3.1.1.5.3 Exploration Potential	271
3.1.1.5.3.1 Activities	272
3.1.1.5.3.2 Investment Requirement.....	274
3.1.1.6 Cyrenaica	275
3.1.1.6.1 Producing Fields.....	275
3.1.1.6.2 Non-Producing Fields.....	275
3.1.1.6.3 Exploration Potential	275

3.1.1.6.3.1 Activities	275
3.1.1.6.3.2 Investment Requirement.....	277
3.1.1.7 Kufra Basin.....	278
3.1.1.7.1 Producing Fields.....	278
3.1.1.7.2 Non-producing Fields.....	278
3.1.1.7.3 Exploration Potential	278
3.1.1.7.3.1 Activities	278
3.1.1.7.3.2 Investment Requirement.....	279
3.1.2 Non-Associated Gas	280
3.1.2.1 Production History	280
3.1.2.2 Sirte Basin.....	282
3.1.2.2.1 Producing Fields.....	282
3.1.2.2.1.1 As Sahel	284
3.1.2.2.1.2 As Surah.....	287
3.1.2.2.1.3 Assumud.....	289
3.1.2.2.1.4 Attahaddy	291
3.1.2.2.1.5 Faregh.....	294
3.1.2.2.1.6 Hateiba	297
3.1.2.2.1.7 Meghil	299
3.1.2.2.2 Non-producing Fields.....	301
3.1.2.2.2.1 Barrut I	304
3.1.2.2.2.2 NC 98-A	306
3.1.2.2.2.3 Tabit	307
3.1.2.2.3 Exploration Potential	309
3.1.2.3 Ghadames Basin	310
3.1.2.3.1 Producing Fields.....	310
3.1.2.3.1.1 Al Wafaa	312
3.1.2.3.2 Non-producing Fields.....	314
3.1.2.3.2.1 Al Atshan	317
3.1.2.3.3 Exploration Potential	319
3.1.2.4 Murzuk Basin.....	320
3.1.2.4.1 Producing Fields.....	320
3.1.2.4.2 Non-producing Fields.....	320
3.1.2.4.3 Exploration Potential	320
3.1.2.5 Offshore/Tripolitania Basin	321
3.1.2.5.1 Producing Fields.....	321
3.1.2.5.1.1 Bahr Essalam.....	323
3.1.2.5.2 Non-producing Fields.....	326
3.1.2.5.2.1 Small Non-Producing Gas Fields	328
3.1.2.5.3 Exploration Potential	330
3.1.2.6 Cyrenaica	331
3.1.2.6.1 Producing Fields.....	331
3.1.2.6.2 Non-producing Fields.....	331



3.1.2.6.3 Exploration Potential	331
3.1.2.7 Kufra Basin.....	332
3.1.2.7.1 Producing Fields.....	332
3.1.2.7.2 Non-producing Fields.....	332
3.1.2.7.3 Exploration Potential	332
3.2 MIDSTREAM.....	333
3.2.1 Pipelines.....	333
3.2.1.1 Status	333
3.2.1.2 Investment Requirement	333
3.2.1.3 Oil	334
3.2.1.3.1 Status	337
3.2.1.3.2 Investment Requirement.....	338
3.2.1.3.2.1 Libya – Egypt.....	338
3.2.1.4 Gas.....	339
3.2.1.4.1 Status	343
3.2.1.4.2 Investment Requirement.....	343
3.2.2 Crude Oil Terminals	344
3.2.2.1 Status	345
3.2.2.2 Investment Requirement	345
3.2.2.3 Existing Terminals.....	345
3.2.2.3.1 Es Sider.....	346
3.2.2.3.1.1 Status	346
3.2.2.3.1.2 Investment Requirement.....	346
3.2.2.3.2 Marsa El Brega	346
3.2.2.3.2.1 Status	346
3.2.2.3.2.2 Investment Requirement.....	347
3.2.2.3.3 Ras Lanuf	347
3.2.2.3.3.1 Status	347
3.2.2.3.3.2 Investment Requirement.....	347
3.2.2.3.4 Marsa El Hariga.....	347
3.2.2.3.4.1 Status	348
3.2.2.3.4.2 Investment Requirement.....	348
3.2.2.3.5 Zueitina.....	348
3.2.2.3.5.1 Status	348
3.2.2.3.5.2 Investment Requirement.....	349
3.2.2.3.6 Zawia	349
3.2.2.3.6.1 Status	349
3.2.2.3.6.2 Investment Requirement.....	350
3.3 DOWNSTREAM	350
3.3.1 Refineries	351
3.3.1.1 Status	351
3.3.1.2 Investment Requirement	352
3.3.1.3 Existing Refineries.....	352



3.3.1.3.1 Ras Lanuf	352
3.3.1.3.1.1 Existing Operations	352
3.3.1.3.1.2 Investment Requirement.....	354
3.3.1.3.2 Zawia	357
3.3.1.3.2.1 Existing Operations	357
3.3.1.3.2.2 Investment Requirement.....	359
3.3.1.3.3 Marsa El Brega	362
3.3.1.3.3.1 Existing Operations	362
3.3.1.3.3.2 Investment Requirement.....	363
3.3.1.3.4 Tobruk	364
3.3.1.3.4.1 Existing Operations	364
3.3.1.3.4.2 Investment Requirement.....	365
3.3.1.3.5 Sarir	366
3.3.1.3.5.1 Existing Operations	366
3.3.1.3.5.2 Investment Requirement.....	366
3.3.1.4 Proposed New Refineries.....	367
3.3.1.4.1 Sabha Refinery	367
3.3.1.4.1.1 Proposed Operations.....	367
3.3.1.4.1.2 Investment Requirement.....	368
3.3.2 Petrochemicals.....	369
3.3.2.1 Status	369
3.3.2.2 Investment Requirement	370
3.3.2.3 Existing Petrochemicals Plants	371
3.3.2.3.1 Marsa el-Brega	371
3.3.2.3.1.1 Existing Operations	371
3.3.2.3.1.2 Investment Requirement.....	371
3.3.2.3.2 Abu Kammash.....	372
3.3.2.3.2.1 Existing Operations	372
3.3.2.3.2.2 Investment Requirement.....	372
3.3.2.3.3 Ras Lanuf	372
3.3.2.3.3.1 Existing Operations	372
3.3.2.3.3.2 Investment Requirement.....	372
3.3.2.4 Proposed Petrochemical Plants	373
3.3.3 Gas Processing.....	373
3.3.3.1 Natural Gas Liquids	374
3.3.3.1.1 Status	374
3.3.3.1.2 Investment Requirement	375
3.3.3.1.3 Existing Natural Gas Liquids Plants	375
3.3.3.1.3.1 Melitah	375
3.3.3.1.3.2 Intisar	376
3.3.3.1.3.3 Zueitina	377
3.3.3.1.4 Proposed Natural Gas Liquids Plants	378
3.3.3.2 Liquefied Natural Gas.....	378

3.3.3.2.1 Status	378
3.3.3.2.2 Investment Requirement	379
3.3.3.2.3 Existing Liquefied Natural Gas Plants	379
3.3.3.2.3.1 Marsa el Brega	379
3.3.3.2.4 Proposed Liquefied Natural Gas Plants	381
3.4 INFRASTRUCTURE	381
3.4.1 Transportation	381
3.4.1.1 Status	381
3.4.1.2 Investment Requirement	381
3.4.1.3 Roads	382
3.4.1.3.1 Existing	382
3.4.1.3.2 Investment Requirement	382
3.4.1.4 Railway	383
3.4.1.4.1 Existing	383
3.4.1.4.2 Investment Requirement	383
3.4.1.5 Air	383
3.4.1.5.1 Existing	383
3.4.1.5.2 Investment Requirement	384
3.4.1.6 Ports	384
3.4.1.6.1 Existing	384
3.4.1.6.2 Investment Requirement	386
3.4.2 Power	386
3.4.2.1 Status	386
3.4.2.2 Investment Requirement	386
3.4.2.3 Generation	387
3.4.2.3.1 Status	387
3.4.2.3.2 Investment Requirement	387
3.4.2.4 Transmission	388
3.4.2.4.1 Status	388
3.4.2.4.2 Investment Requirement	388
3.5 LOCAL CONTRACTOR CAPABILITY	389
Appendices	391
APPENDIX 1	393
<i>Law No.5 Detail</i>	<i>393</i>
APPENDIX 2	418
<i>Investor's Guide</i>	<i>418</i>
List of Figures	432
List of Tables	434
List of Tables	434
Index	446

List of Figures

Figure 1: Libya's Hydrocarbon Provinces	30
Figure 2: Blocks offered in EPSA IV rounds	46
Figure 3: Libya's Hydrocarbon Provinces	50
Figure 4: Libya's Total Oil Production since 1961.....	52
Figure 5: Location Map Showing the Producing Oil Fields in the Sirte Basin	56
Figure 6: Location Map Showing the Non-Producing Oil Fields in the Sirte Basin	198
Figure 7: Location Map Showing the Producing Oil Fields in the Libyan Sector of the Ghadames Basin	217
Figure 8: Location Map Showing the Non-producing Oil Fields in the Libyan Sector of the Ghadames Basin.....	225
Figure 3.9: Area 47 – Libya	229
Figure 3.10: Area 47 – Drilling locations and prospects	230
Figure 11: Location Map Showing the Producing Oil Fields in the Murzuk Basin	242
Figure 12: Location Map Showing the Non-Producing Oil Fields in the Murzuk Basin	253
Figure 13: Location Map Showing the Producing Oil Fields in the Offshore/Tripolitania Basin...	261
Figure 14: Location Map Showing the Non-Producing Oil Fields in the Offshore/Tripolitania Basin	268
Figure 15: Libya's Natural Gas Production since 1961	281
Figure 16: Location Map Showing the Producing Non-Associated Gas Fields in the Sirte Basin..	283
Figure 17: Location Map Showing the Non-Producing Gas Fields in the Sirte Basin	303
Figure 18: Location Map Showing the Producing Gas Fields in the Ghadames Basin.....	311
Figure 19: Location Map Showing the Non-Producing Gas Fields in the Ghadames Basin.....	316
Figure 20: Location Map Showing the Producing Gas Fields in the Offshore/Tripolitania Basin..	322
Figure 21: Location Map Showing the Non-Producing Gas Fields in the Offshore/Tripolitania Basin	327
Figure 22: Map Showing Libya's Oil Pipeline Network	335
Figure 23: Map Showing Libya's Gas Pipeline Network.....	341
Figure 24: Libya's Crude Oil Terminals)	344
Figure 25: Location of Libya's Oil Refineries.....	351
Figure 26: Locations of Libya's Petrochemical Facilities	370
Figure 27: Location of Libya's Gas Processing Plant.....	374

List of Tables

Table 1.1: Libya's Potential Ultimately Recoverable Oil and Gas Reserves by Basin	13
Table 1.2: Libya's Remaining Ultimately Recoverable Oil, Gas and Condensate Reserves by Petroleum Province	15
Table 1.3: Summary of Investment Required for Libya's Oil and Gas Industry and Associated Infrastructure	17
Table 1.4: Potential Remaining Ultimately Recoverable Reserves Base of Libya's Upstream Oil Fields.....	18
Table 1.5: Capital Investment Required of Libya's Upstream Oil Fields	19
Table 1.6: Potential Remaining Ultimately Recoverable Reserves Base of Libya's Upstream Non-Associated Gas Fields	19
Table 1.7: Capital Investment Requirement of Libya's Upstream Non-Associated Gas Fields.....	20
Table 1.8: Summary of Libya's Existing Pipeline Network.....	20
Table 1.9: Libya's Main Oil Pipelines running to the Oil Terminals	21
Table 1.10: Proposed and Potential Pipeline Investments	21
Table 1.11: Capacity of Libya's Liquids Export Terminals Systems and Their Status.....	22
Table 1.12: Libya's Export Terminals – Summary of Investment Requirement.....	22
Table 1.13: Summary of Libya's Nameplate Oil Refining Capacity.....	23
Table 1.14 Libya's Refineries – Summary of Investment Requirement.....	23
Table 1.15: Summary of Libya's Nameplate Petrochemical Plant Capacity.....	24
Table 1.16: Summary of Libya's Investment Requirements for Petrochemical Plants	25
Table 1.17: Summary of Libya's Nameplate Gas Processing Capacity	26
Table 1.18: Summary of Libya's Nameplate LNG Capacity.....	26
Table 1.19: Libya's Gas Processing Sector - Summary of Business Opportunity	27
Table 1.20: Investment Requirement in Libya's Transportation Infrastructure	27
Table 1.21: Summary of Capital Investment Associated with Libya's Power Generation Industry	28
Table 2.1: Libya's Potential Ultimately Recoverable Oil and Gas Reserves by Basin	32
Table 2.2: Libya's Remaining Ultimately Recoverable Oil, Gas and Condensate Reserves by Petroleum Province	34
Table 2.3 Sirte Basin Oil fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary.....	36
Table 2.4 Ghadames Basin Oil fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary.....	38
Table 2.5 Murzuk Basin Oil fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary.....	38
Table 2.6 Offshore/Tripolitania Basin Oil fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary	39

Table 2.7 Cyrenaica Oil fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary.....	40
Table 2.8 Kufra Basin Oil fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary.....	40
Table 2.9 Sirte Basin Non-associated Gas Fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary	41
Table 2.10 Ghadames Basin Non-associated Gas Fields and Prospects, Hydrocarbons In-Place and Ultimately Recoverable Reserves Summary.....	42
Table 2.11 Murzuk Basin Non-associated Gas Fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary	42
Table 2.12 Offshore/Tripolitania Basin Non-associated Gas Fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary.....	43
Table 2.13 Cyrenaica Non-associated Gas Fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary	43
Table 2.14 Kufra Basin Non-associated Gas Fields and Prospects, Hydrocarbons In-Place and Remaining Recoverable Reserves Summary	44
Table 3.1: Libya's Oil Production.....	50
Table 3.2: Sirte Basin Producing Oil Fields – Reserves Summary	53
Table 3.3: Sirte Basin Producing Oil Fields - Summary of Business Opportunity	58
Table 3.4: Abu Maras Key Field Data	61
Table 3.5: Abu Maras Commercial Data	61
Table 3.6: Abu Maras Redevelopment Investment Summary	62
Table 3.7: Ali Key Field Data.....	63
Table 3.8: Ali Commercial Data	64
Table 3.9: Ali Redevelopment Investment Summary	64
Table 3.10: Almas Kay Field Data.....	65
Table 3.11: Almas Commercial Data.....	66
Table 3.12: Almas Redevelopment Investment Summary.....	66
Table 3.13: Amal Key Field Data	67
Table 3.14: Amal Key Commercial Data.....	68
Table 3.15: Amal Redevelopment Investment Summary	69
Table 3.16: Antlat Key Field Data	70
Table 3.17: Antlat Commercial Data	71
Table 3.18: Antlat Redevelopment Investment Summary	72
Table 3.19: Arbab Kay Field Data	72
Table 3.20: Arbab Commercial Data	73
Table 3.21: Arbab Redevelopment Investment Summary	74
Table 3.22: As-Sarah Kay Field Data	75

Table 3.23: As-Sarah Commercial Data	75
Table 3.24: As-Sarah Redevelopment Investment Summary	76
Table 3.25: Bahi Key Field Data	77
Table 3.26: Bahi Commercial Data.....	78
Table 3.27: Bahi Redevelopment Investment Summary	79
Table 3.28: Balat Key Field Data.....	80
Table 3.29: Balat Commercial Data.....	81
Table 3.30: Balat Redevelopment Investment Summary.....	82
Table 3.31: Beda Key Field Data.....	83
Table 3.32: Beda Commercial Data.....	83
Table 3.33: Beda Redevelopment Investment Summary.....	84
Table 3.34: Bu Alawn Key Field Data.....	85
Table 3.35: Bu Alawn Commercial Data.....	86
Table 3.36: Bu Alawn Redevelopment Investment Summary.....	87
Table 3.37: Bu Attifel Key Field Data.....	88
Table 3.38: Bu Attifel Commercial Data	89
Table 3.39: Bu Attifel Redevelopment Investment Summary.....	90
Table 3.40: Dahra Key Field Data	91
Table 3.41: Dahra Commercial Data	92
Table 3.42: Dahra Redevelopment Investment Summary	93
Table 3.43: Defa Key Field Data	94
Table 3.44: Defa Commercial Data	95
Table 3.45: Defa Redevelopment Investment Summary	95
Table 3.46: Ed Dib Key Field Data.....	97
Table 3.47: Ed Dib Commercial Data.....	97
Table 3.48: Ed Dib Redevelopment Investment Summary.....	98
Table 3.49: El-Meheiriga Key Field Data.....	99
Table 3.50: El-Meheiriga Commercial Data.....	100
Table 3.51: El-Meheiriga Redevelopment Investment Summary.....	100
Table 3.52: En Naga Key Field Data	102
Table 3.53: En Naga Commercial Data	103
Table 3.54: En Naga Redevelopment Investment Summary	104
Table 3.55: Facha Key Field Data	104
Table 3.56: Facha Commercial Data.....	105
Table 3.57: Facha Redevelopment Investment Summary	106
Table 3.58: Farrud Key Field Data	107

Table 3.59: Farrud Commercial Data	107
Table 3.60: Farrud Redevelopment Investment Summary	108
Table 3.61: Fidda Key Field Data.....	108
Table 3.62: Fidda Commercial Data	109
Table 3.63: Fidda Redevelopment Investment Summary	110
Table 3.64: Ghani Key Field Data	111
Table 3.65: Ghani Commercial Data	112
Table 3.66: Ghani Redevelopment Investment Summary	112
Table 3.67: Gialo Key Field Data	114
Table 3.68: Gialo Commercial Data	115
Table 3.69: Gialo Redevelopment Investment Summary	115
Table 3.70: Hamid Key Field Data	116
Table 3.71: Hamid Commercial Data	117
Table 3.72: Hamid Redevelopment Investment Summary	118
Table 3.73: Hofra Key Field Data.....	119
Table 3.74: Hofra Commercial Data.....	120
Table 3.75: Hofra Redevelopment Investment Summary.....	121
Table 3.76: Intisar Key Field Data.....	123
Table 3.77: Intisar Commercial Data.....	124
Table 3.78: Intisar Redevelopment Investment Summary.....	125
Table 3.79: Kotla Key Field Data	125
Table 3.80: Kotla Commercial Data	126
Table 3.81: Kotla Redevelopment Investment Summary	127
Table 3.82: Lehib / Dor Marada Key Field Data	128
Table 3.83: Lehib / Dor Marada Commercial Data	129
Table 3.84: Lehib / Dor Marada Redevelopment Investment Summary	129
Table 3.85: Mabruk Key Field Data	130
Table 3.86: Mabruk Commercial Data	131
Table 3.87: Mabruk Redevelopment Investment Summary	132
Table 3.88: Messla Key Field Data.....	133
Table 3.89: Messla Commercial Data.....	134
Table 3.90: Messla Redevelopment Investment Summary.....	135
Table 3.91: Nafoora Key Field Data.....	136
Table 3.92: Nafoora-Augila Commercial Data.....	137
Table 3.93: Nafoora Redevelopment Investment Summary	138
Table 3.94: Nakhla Key Field Data	139

Table 3.95: Nakhla Commercial Data.....	140
Table 3.96: Nakhla Redevelopment Investment Summary	141
Table 3.97: Nasser (Zelten) Key Field Data	143
Table 3.98: Nasser (Zelten) Commercial Data	144
Table 3.99: Nasser (Zelten Redevelopment Investment Summary.....	145
Table 3.100: Qusur Key Field Data	145
Table 3.101: Qusur Commercial Data	146
Table 3.102: Qusur Redevelopment Investment Summary	147
Table 3.103: Raguba Key Field Data.....	148
Table 3.104: Raguba Commercial Data.....	149
Table 3.105:Raguba Redevelopment Investment Summary.....	149
Table 3.106: Rakb Key Field Data.....	150
Table 3.107: Rakb Commercial Data.....	151
Table 3.108: Rakb Redevelopment Investment Summary.....	152
Table 3.109: Rimal-Khatib Key Field Data	154
Table 3.110: Rimal-Khatib Commercial Data	154
Table 3.111: Rimal-Khatib Redevelopment Investment Summary	155
Table 3.112: Sabah Key Field Data	157
Table 3.113: Sabah Commercial Data	157
Table 3.114: Sabah Redevelopment Investment Summary	158
Table 3.115: Safsaf Key Field Data	159
Table 3.116: Safsaf Commercial Data	160
Table 3.117: Safsaf Redevelopment Investment Summary	161
Table 3.118: Sahabi Key Field Data	161
Table 3.119: Sabah Commercial Data	162
Table 3.120: Sahabi Redevelopment Investment Summary	163
Table 3.121: Samah Key Field Data	164
Table 3.122: Samah Commercial Data	165
Table 3.123: Sahabi Redevelopment Investment Summary	166
Table 3.124: Sarir C, Sarir L and Sarir North Features	167
Table 3.125: Sarir Group Key Field Data	168
Table 3.126: Sarir Group Commercial Data	169
Table 3.127: Sarir Group Redevelopment Investment Summary	170
Table 3.128: Shatirah Key Field Data.....	171
Table 3.129: Shatirah Commercial Data.....	171
Table 3.130: Shatirah Redevelopment Investment Summary.....	172

3.1.1.2.1.25 Intisar

Intisar actually represents a group of genetically related fields in close proximity to each other. Nine structures containing hydrocarbons have been discovered, however it appears that only seven largest ones have been developed. These are Intisar A, B, C, D, E, H, L, N and T.

Intisar A reef (originally named Idris) was the first of the fields discovered by Occidental in 1967 in Concession 103 and flowed oil at a rate of 43,000 barrels per day. Successive wildcats also discovered reserves in pinnacle reefs, the largest of which is Intisar D, which flowed at a rate of 75,000 barrels per day (the highest ever measured in Libya). An evaluation conducted in 1967 estimated the reserves at over 3 billion barrels in total. Subsequent discoveries established the presence of ten reefs altogether, with original reserves of over 3.2 billion barrels in total. Of these, Intisar D with 1.8 billion and Intisar A with 750 million barrels of original reserves are giant fields.

Intisar A and D were the first fields to come on stream in early 1968 and were connected to the pipeline network in the same year. Intisar C was the next field to be brought on stream in 1970. No natural pressure support was expected due to the isolated nature of the reefal reservoirs, so bottom water injection supplemented by crestal gas injection was used to increase the recovery factor. Brady et al. (1980, 1981) estimated that the ultimate recovery factor for these fields will be in the range of 75-80%.

In 1969, after the overthrow of the monarchy in Libya, the new government imposed draconian production cuts in order to secure a more equitable posted price for oil produced in Libya. Occidental's production, which at that time was 800,000 barrels per day (mainly from the Intisar fields) was cut to 440,000 by August 1970. The production restrictions were lifted afterwards, when the Libyan government forced Occidental to concede to an increase in posted price of oil as well as an increase in tax.

EOR is known to have been used on the Intisar D reef, from which around 70% of the OOIP has been recovered. Gas has been injected at the crest, while water flooding is used lower in the reservoir.

Intisar E has also been redeveloped between 1999 and 2002. The redevelopment comprised 6 vertical injectors and 6 horizontal producers and re-completion of the existing 8 wells as commingled and/or dual producers. This resulted in a production increase from 6,400 barrels per day in 1999 to 20,000 barrels per day in 2002.

The hydrocarbons are contained in a system of Paleocene (Thanetian) pinnacle reefs, which directly overlay the Sirth Shale source kitchen, located in the Ajdabiya Trough. Sirt Shale (Upper Cretaceous) is the main source, although Paleocene source rocks (Sheterat Shale) may have also contributed. The Intisar fields have been charged by vertical migration through porous carbonates. Seal is provided by regional shale cap rock of Harash and Khayir Formations. Individual reefs reach 5km in diameter and 385m in height. Although Intisar D is full to spill, some of the other reefs are not and a couple do not contain hydrocarbons at all. It is believed that this is a result of difficulties relating to migration pathway.

In the Intisar D field a smaller oil accumulation is present in the shallow El Giza Limestone and is produced using seven wells. It is unclear if other fields have equivalent shallow hydrocarbon accumulations.

Although much effort has been made, the whole reef trend has not been explored yet and the potential for discoveries remains.

Gas injection has been used on the Intisar fields and D and E in particular. Gas production from a range of surrounding fields has been piped to the gas processing facility at Intisar and then



injected. The field was equipped by compressors capable of injecting up to 700 million scf of gas per day in 1972.

The quantity of injected gas is unknown. However, it can be estimated that somewhere in the region of 1-4 trillion cubic feet of gas could have been injected, given the volume of oil which has been extracted (a good part of which has been replaced by the injected gas).

Zueitina Oil Company planned to start producing gas from the Intisar D field gas cap in 2006. The gas would be piped to Sahel field. It is unknown if this project has been completed.

Key Field Data

Table 3.76: Intisar Key Field Data

Parameter			Value
Discovery Date			1967
On-stream Date			1968
Recoverable Reserves	Original	Oil (Million Barrels)	3,200
		Gas (Billion Cubic Feet)	1,630
	Remaining	Oil (Million Barrels)	1,000
		Gas (Billion Cubic Feet)	509 + injected ⁷²
Production	Current	Oil (Barrels per day)	75,000
		Gas (Million Standard Cubic Feet per day)	38
	Potential	Oil (Barrels per day)	200,000
		Gas (Million Standard Cubic Feet per day)	101.8
Geology	Producing Horizon(s)		Intisar/Upper Sabil Fm. Palaeocene/Thanetian and El Giza Mbr (Middle Eocene)
	Rock Type(s)		Coral-algal reefs (Intisar), limestones (El Giza)
	Reservoir Depth (Feet)		4,800-9,810
	Gross Rock Volume (Million Cubic Feet)		700,000
	Reservoir Thickness (Feet)		452
	Porosity (%)		22% average (4-35%)
Fluid Properties	Oil	Gravity (° API)	25.8-51.4
		Sulphur Content (wt %)	low
		Pour Point (°C)	
		Wax Content (wt %)	
	Gas	Gas Oil Ratio (Standard Cubic Feet/barrel)	509 (original)
		Hydrogen Sulphide Content (mol %)	0 – 0.1
		Carbon Dioxide Content (mol %)	1.9 – 2.6
		Molecular Weight	
Existing Facilities	Subsurface ⁷³	Number of Producers	13+7 ⁷⁴ +30 (estimate)
		Number of Gas Injectors	7+15 (estimate)
		Number of Water Injectors	11+30 (estimate)

⁷² It is estimated that between 1 and 4 TCF of gas has been injected.

⁷³ The number of wells is quoted for the Intisar D field (first number) and estimated for the remaining Intisar fields (last number)

⁷⁴ 13 production wells for the main reef reservoir and seven which are producing the oil pool in the shallow El Giza Member of the Gialo (Yalu) Formation.

Parameter			Value
	Surface	Separation Capacity (bpd)	-
		Compression Capacity (MMscfd)	-
		Acid Gas Treatment Capacity (MMscfd)	-

Commercial Data

Intisar A was the first of the fields, discovered by Occidental in 1967. The fields were developed by Occidental, with Intisar A and D brought on stream in 1968, followed by Intisar C in 1970.

In 1974 the Libyan government pushed for state participation in oil production and by the summer had acquired 50% or more in many concessions, including Occidental's Intisar fields. Finally, Occidental withdrew from Libya in 1986, when the US government barred US firms from doing business in Libya.

Currently, the fields are operated by the Zueitina Oil Company. Since the lifting of US sanctions against Libya in the spring of 2004 Occidental has been engaged in negotiations with Libyan authorities to resume operation of properties which were operated by the company prior to its withdrawal from Libya in 1986.

Table 3.77: Intisar Commercial Data

Parameter		Value
Contract Type		
Contract Effective Date		
Operator		Zueitina Oil Company
Equity (%)	Zueitina Oil company	100%

Investment Requirement

The Libyan government has yet to publicise their plans for the future redevelopment of this field and development of two undeveloped discoveries. Our view is that from a purely technical point of view the field could benefit from additional investment. Whether this investment is conducted solely by the operator or with outside assistance has yet to be decided.

Below we present what we believe would be a probable redevelopment plan given the current status of the field. In our view redevelopment would be conducted in a number of stages:

- Work over and re-completion of a significant proportion of the existing producers to achieve improved reliable recovery from areas currently in production.
- Refurbishment of existing production equipment to provide a reliable production base with this followed by a production expansion to allow for additional production from the existing fields and incorporation of two undeveloped fields.
- Implementation of a seismic survey and assessment of the field to gather data to plan further redevelopment activities and appraisal of two undeveloped structures.
- Implementation of appraisal drilling in order to develop two remaining undeveloped structures.
- Implementation of infill drilling targeting poorly drained areas of the field identified by seismic and other surveys and the remaining two untapped fields discovered in the area.
- Development and tie-back of two untapped existing discoveries with reserves of 300 million barrels.

The program outlined above is one that might typically be adopted in the redevelopment of any old large producing field.

Table 3.78: Intisar Redevelopment Investment Summary

Project	Rationale	Time Frame (Years) ⁷⁵	Cost Estimate (Million \$) ⁷⁶
Subsurface			
Work Over and Re-complete existing producers and injectors	Work over and re-complete selected producers to boost production from field areas currently in production and to achieve reliable production from the existing wells; Number of Producers: 50	1 - 5	50-70
Appraisal Drilling and 3D Seismic	Drilling of appraisal wells and 3D seismic survey on two undeveloped structures; Number of Wells: 2 (one each) and 20km ² 3D Survey.	2-3	20-40
Development Drilling Discovered Field	Drilling of producers to produce from two undeveloped discoveries with 150 million barrels recoverable each; Number of Producers: 8. Number of Injectors: 16	3-4	90-150
Subtotal			160 - 260
Surface			
Surface Facilities Rehabilitation	Refurbishment of existing facility to maintain stable production includes replacement of equipment, control systems and material where necessary.	1 - 2	260 - 520
Subtotal			260 - 520
Total			320 - 780

This is a Sample field write up - 4 Pages - from our Libya Oil and Gas Strategic Report Showing Key elements:

Field Description
Key Field Data Table
Commercial Data
Field Development Planning Assessment
Capital Investment Assessment

Most fields reach the level of data definition shown in this sample. The data sets associated with a considerable number of fields are more extensive than this - the larger producing fields and those currently being developed by International Oil Companies

Table 3.131: Tibisti Key Field Data.....	173
Table 3.132: Tibisti Commercial Data.....	174
Table 3.133: Tibisti Redevelopment Investment Summary.....	174
Table 3.134: Tuama Key Field Data.....	175
Table 3.135: Tuama Commercial Data.....	176
Table 3.136: Tuama Redevelopment Investment Summary.....	177
Table 3.137: Umm al Farrud Key Field Data	178
Table 3.138: Umm Al Farrud Commercial Data	179
Table 3.139: Umm Al Farrud Redevelopment Investment Summary	179
Table 3.140: Wadi Key Field Data	180
Table 3.141: Wadi Commercial Data	181
Table 3.142: Wadi Redevelopment Investment Summary	182
Table 3.143: Waha Key Field Data.....	183
Table 3.144: Waha Commercial Data.....	184
Table 3.145: Waha Redevelopment Investment Summary.....	185
Table 3.146: Zaggut Key Field Data.....	186
Table 3.147: Zaggut Commercial Data.....	187
Table 3.148: Zaggut Redevelopment Investment Summary.....	187
Table 3.149: Zella Key Field Data.....	188
Table 3.150: Zella Commercial Data.....	189
Table 3.151: Zella Redevelopment Investment Summary.....	190
Table 3.152: Zenad Key Field Data.....	190
Table 3.153: Zenad Commercial Data.....	191
Table 3.154: Zenad Redevelopment Investment Summary.....	192
Table 3.155: Sirte - Small Producing Fields Key Field Data.....	194
Table 3.156: Sirte - Small Producing Fields Commercial Data.....	194
Table 3.157: Sirte Small Producing Field Redevelopment Investment Summary	195
Table 3.158: Sirte Basin Non-Producing Oil Fields – Reserves Summary	196
Table 3.159: Sirte Basin Non-Producing Oil Fields - Summary of Business Opportunity	200
Table 3.160: Abu Quray Key Field Data	200
Table 3.161: Abu Quray Commercial Data	201
Table 3.162: Abu Quray Development Investment Summary.....	202
Table 3.163: Beda South Key Field Data	202
Table 3.164: Beda South Commercial Data.....	203
Table 3.165: En Naga A Key Field Data	204
Table 3.166: En Naga A Commercial Data	204

Table 3.167: En Naga A Development Investment Summary	205
Table 3.168: Sirte - Small Non-Producing Fields Key Field Data	207
Table 3.169: Sirte – Small Non-Producing Fields Commercial Data.....	207
Table 3.170: Sirte – Small Non-Producing Field Development Investment Summary.....	208
Table 3.171 Sirte Basin Blocks awarded in EPSA4 first round.....	209
Table 3.172 Sirte Basin Blocks awarded in EPSA4 second round.....	210
Table 3.173 Sirte Basin Blocks awarded in EPSA4 third round	210
Table 3.174 Sirte Basin Blocks awarded in EPSA4 fourth round	214
Table 3.175 Sirte Basin Estimated Exploration Summary, Cost and Timing.....	215
Table 3.176: Libyan Sector of Ghadames Basin Producing Oil Fields – Reserves Summary	216
Table 3.177: Libyan Sector of Ghadames Basin Producing Oil Fields - Summary of Business Opportunity	218
Table 3.178: Hamada Group Key Field Data	219
Table 3.179: Hamada Group Commercial Data.....	220
Table 3.180: Hamada Group Redevelopment Investment Summary	220
Table 3.181: Al Kabir Group Key Field Data.....	222
Table 3.182: Al Kabir Group Commercial Data.....	222
Table 3.183: Al Kabir Group Development Investment Summary	223
Table 3.184: Libyan Sector of Ghadames Basin Non-producing Oil Fields – Reserves Summary	224
Table 3.185: Libyan Sector of Ghadames Basin Non-producing Oil Fields - Summary of Business Opportunity	226
Table 3.186: Northern Group Key Field Data	226
Table 3.187: Northern Group Commercial Data	227
Table 3.188: Northern Group Development Investment Summary	228
Table 3.189: Area 47 drilling and testing status at January 12, 2009.	230
Table 3.190: Area 47 Group Key Field Data	232
Table 3.191: Area 47 Group Commercial Data	233
Table 3.192: Area 47 Group Development Investment Summary.....	234
Table 3.193: Ghadames Basin Blocks offered in EPSA4 first round	236
Table 3.194 Ghadames Basin Blocks awarded in EPSA4 second round.....	238
Table 3.195 Ghadames Basin Blocks awarded in EPSA4 third round	238
Table 3.196 Ghadames Basin Blocks awarded in EPSA4 fourth round.....	239
Table 3.197 Ghadames Basin Estimated Exploration Summary, Cost and Timing	240
Table 3.198: Murzuk Basin Producing Oil Fields – Reserves Summary	241
Table 3.199: Murzuk Basin Producing Oil Fields - Summary of Business Opportunity	242
Table 3.200: Elephant Key Field Data.....	244

Table 3.201: Elephant Commercial Data.....	245
Table 3.202: Elephant Redevelopment Investment Summary.....	245
Table 3.203: El Sharara Key Field Data	247
Table 3.204: El Sharara Commercial Data	248
Table 3.205: El Sharara Redevelopment Investment Summary	248
Table 3.206: NC 186 Key Field Data	250
Table 3.207: NC 186 Commercial Data.....	250
Table 3.208: NC 186 Development Investment Summary	251
Table 3.209: Murzuk Basin Non-Producing Oil Fields – Reserves Summary	252
Table 3.210: Murzuk Basin Non-Producing Oil Fields - Summary of Business Opportunity	253
Table 3.211: NC101 Fields Key Field Data.....	254
Table 3.212: NC101 Fields Commercial Data.....	255
Table 3.213: NC101 Fields Development Investment Summary	256
Table 3.214 Murzuk Basin Blocks awarded in EPSA4 first round	257
Table 3.215 Murzuk Basin Blocks awarded in EPSA4 second round.....	258
Table 3.216 Murzuk Basin Blocks awarded in EPSA4 third round	258
Table 3.217 Murzuk Basin Blocks offered in EPSA4 fourth round	259
Table 3.218 Murzuk Basin Estimated Exploration Summary, Cost and Timing	259
Table 3.219: Offshore/Tripolitania Basin Producing Oil Fields – Reserves Summary.....	260
Table 3.220: Offshore/Tripolitania Basin Producing Oil Fields - Summary of Business Opportunity	262
Table 3.221: Bouri Key Field Data.....	263
Table 3.222: Bouri Commercial Data	264
Table 3.223: Bouri Redevelopment Investment Summary	265
Table 3.224: Al Jurf Key Field Data.....	266
Table 3.225: Al Jurf Commercial Data.....	266
Table 3.226: Al Jurf Redevelopment Investment Summary.....	267
Table 3.227: Offshore/Tripolitania Basin Producing Oil Fields – Reserves Summary.....	267
Table 3.228: Offshore/Tripolitania Basin Non-Producing Oil Fields - Summary of Business Opportunity	269
Table 3.229: - Non-Producing Fields Key Field Data	270
Table 3.230: Tripolitania – Non-Producing Fields Commercial Data.....	270
Table 3.231: Offshore/Tripolitania Small Non-Producing Field Redevelopment Investment Summary	271
Table 3.232 Offshore/Tripolitania Basin Blocks awarded in EPSA4 first round.....	272
Table 3.233 Offshore/Tripolitania Basin Blocks awarded in EPSA4 second round	273

Table 3.234 Offshore/Tripolitania Basin Blocks awarded in EPSA4 fourth round.....	273
Table 3.235 Offshore/Tripolitania Basin Estimated Exploration Summary, Cost and Timing.....	274
Table 3.236 Cyrenaica Blocks awarded in EPSA4 first round	275
Table 3.237 Cyrenaica Blocks awarded in EPSA4 second round	276
Table 3.238 Cyrenaica Blocks awarded in EPSA4 third round.....	276
Table 3.239 Cyrenaica Blocks awarded in EPSA4 fourth round.....	276
Table 3.240 Cyrenaica Estimated Exploration Summary, Cost and Timing.....	277
Table 3.241 Kufra Basin Blocks awarded in EPSA4 second round	278
Table 3.242 Kufra Basin Blocks awarded in EPSA4 third round.....	279
Table 3.243 Kufra Basin Estimated Exploration Summary, Cost and Timing.....	279
Table 3.244: Libya's Gas Production Split from 1999 to 2003.....	280
Table 3.245: Libya's Gas Production	280
Table 3.246: Sirte Basin Producing Gas Fields – Reserves Summary	282
Table 3.247: Sirte Basin Producing Gas Fields - Summary of Business Opportunity	284
Table 3.248: As Sahel Key Field Data.....	285
Table 3.249: As Sahel Commercial Data.....	285
Table 3.250: As Sahel Redevelopment Investment Summary.....	286
Table 3.251: As Surah Key Field Data	287
Table 3.252: As Surah Commercial Data	288
Table 3.253: As Surah Redevelopment Investment Summary	288
Table 3.254: Assumud Key Field Data.....	289
Table 3.255: Assumud Commercial Data.....	290
Table 3.256: Assumud Redevelopment Investment Summary.....	291
Table 3.257: Attahaddy Key Field Data	292
Table 3.258: Attahaddy Commercial Data	292
Table 3.259: Attahaddy Redevelopment Investment Summary	293
Table 3.260: Faregh Key Field Data.....	294
Table 3.261: Faregh Commercial Data	296
Table 3.262: Faregh Redevelopment Investment Summary	296
Table 3.263: Hateiba Key Field Data.....	297
Table 3.264: Hateiba Commercial Data.....	298
Table 3.265: Hateiba Redevelopment Investment Summary.....	299
Table 3.266: Meghil Key Field Data	300
Table 3.267: Meghil Commercial Data.....	300
Table 3.268: Meghil Redevelopment Investment Summary	301
Table 3.269: Sirte Basin Non-Producing Gas Fields – Reserves Summary	302

Table 3.270: Sirte Basin Non-Producing Gas Fields - Summary of Business Opportunity	304
Table 3.271: Barrut I Key Field Data	304
Table 3.272: Barrut I Commercial Data.....	305
Table 3.273: Barrut I Development Investment Summary	306
Table 3.274: NC 98-A Key Field Data	306
Table 3.275: NC 98-A Commercial Data	307
Table 3.276: Tabit Key Field Data.....	307
Table 3.277: Tabit Commercial Data.....	308
Table 3.278: Tabit Development Investment Summary	309
Table 3.279: Ghadames Basin Producing Gas Fields – Reserves Summary	310
Table 3.280: Ghadames Basin Producing Gas Fields - Summary of Business Opportunity	312
Table 3.281: Al Wafaa Key Field Data.....	312
Table 3.282: Al Wafaa Commercial Data.....	313
Table 3.283: Al Wafaa Redevelopment Investment Summary.....	314
Table 3.284: Ghadames Basin Non-Producing Gas Fields – Reserves Summary.....	315
Table 3.285: Ghadames Basin Non-Producing Gas Fields - Summary of Business Opportunity...	317
Table 3.286: Al Atshan Key Data.....	317
Table 3.287: Al Atshan Commercial Data.....	318
Table 3.288: Al Atshan Development Investment Summary	319
Table 3.289: Offshore/Tripolitania Producing Gas Fields – Reserves Summary.....	321
Table 3.290: Offshore/Tripolitania Producing Gas Fields - Summary of Business Opportunity....	322
Table 3.291: Bahr Essalam Key Field Data.....	324
Table 3.292: Bahr Essalam Commercial Data	324
Table 3.293: Bahr Essalam Redevelopment Investment Summary	325
Table 3.294: Offshore/Tripolitania Non-Producing Gas Fields – Reserves Summary.....	326
Table 3.295: Offshore/Tripolitania Non-Producing Gas Fields - Summary of Business Opportunity	328
Table 3.296: Offshore/Tripolitania - Non-Producing Fields Key Field Data	328
Table 3.297: Offshore/Tripolitania – Non-Producing Fields Commercial Data	329
Table 3.298: Offshore/Tripolitania Small Non-Producing Gas Field Redevelopment Investment Summary	330
Table 3.299: Summary of Libya’s Existing Pipeline Network.....	333
Table 3.300: Libya’s Main Oil Pipelines running to Oil Terminals	333
Table 3.301: Proposed and Potential Pipeline Investments	334
Table 3.302: Libya’s Existing Crude Oil Pipelines	337
Table 3.303: Libya’s Existing Oil Products Pipelines	338

Table 3.304: Libya's Main Oil Pipelines - Summary of Business Opportunity.....	338
Table 3.305: Libya's Existing Natural Gas Pipelines	343
Table 3.306: Libya's Main Gas Pipelines - Summary of Business Opportunity	344
Table 3.307: Capacity of Libya's Liquids Export Terminals Systems and Their Status.....	345
Table 3.308 Libya's Export Terminals – Summary of Investment Requirement.....	345
Table 3.309: Type and Size of Crude Oil Loading Facilities at Es Sider	346
Table 3.310: Type and Size of Crude Oil Loading Facilities at Marsa El Brega	346
Table 3.311: Type and Size of Crude Oil Loading Facilities at Ras Lanuf.....	347
Table 3.312: Type and Size of Crude Oil Loading Facilities at Marsa El Hariga	348
Table 3.313: Type and Size of Crude Oil Loading Facilities at Zueitina	348
Table 3.314: Type and size of Crude Oil Loading Facilities at Zawia	349
Table 3.315: Summary of Libya's Nameplate Oil Refining Capacity.....	351
Table 3.316 Libya's Refineries – Summary of Investment Requirement.....	352
Table 3.317: Ras Lanuf Oil Refinery Existing Operations Summary	353
Table 3.318: Ras Lanuf Oil Refinery Product Capacities and Quality	354
Table 3.319: Ras Lanuf Refinery Refurbishment and Modernisation Projects	355
Table 3.320: Zawia Oil Refinery Existing Operations Summary	357
Table 3.321: Zawia Oil Refinery Product Capacities and Quality	358
Table 3.322: Zawia Refinery Refurbishment and Modernisation Projects.....	360
Table 3.323: Marsa El Brega Oil Refinery Existing Operations Summary	362
Table 3.324: Marsa El Brega Oil Refinery Product Capacities and Quality	363
Table 3.325: Marsa El Brega Refinery Refurbishment and Modernisation Projects.....	363
Table 3.326: Tobruk Oil Refinery Existing Operations Summary	364
Table 3.327: Tobruk Oil Refinery Product Capacities and Quality.....	364
Table 3.328: Tobruk Refinery Refurbishment and Modernisation Projects.....	365
Table 3.329: Sarir Oil Refinery Existing Operations Summary	366
Table 3.330: Sarir Oil Refinery Product Capacities and Quality.....	366
Table 3.331: Sarir Refinery Refurbishment and Modernisation Projects.....	366
Table 3.332: Sabha Refinery Complex Proposed Operations Summary	367
Table 3.333: Sabha Refinery Proposed Product Capacities and Quality	368
Table 3.334: Proposed Sabha Refinery Complex Modernisation Projects.....	368
Table 3.335: Summary of Libya's Nameplate Petrochemical Plant Capacity.....	369
Table 3.336: Summary of Investment Opportunity in Libya's Petrochemical Industry.....	371
Table 3.337: Marsa el Brega Petrochemical Centre Existing Plants Summary.....	371
Table 3.338: Summary of Abu Kammash	372
Table 3.339: Summary of Ras Lanuf	372

Table 3.340: Summary of Ras Lanuf second phase development	373
Table 3.341: Summary of Libya's Nameplate Gas Processing Capacity	374
Table 3.342: Melitah Existing Operations Summary.....	375
Table 3.343: Melitah Product Capacities and Quality	376
Table 3.344: Intisar Existing Operations Summary	376
Table 3.345: Intisar Product Capacities and Quality	377
Table 3.346: Zueitina Existing Operations Summary.....	377
Table 3.347: Zueitina Product Capacities and Quality	378
Table 3.348: Summary of Libya's Nameplate LNG Capacity.....	379
Table 3.349: Libya's Gas Processing Sector - Summary of Business Opportunity	379
Table 3.350: Technical Summary for the Marsa el Brega	380
Table 3.351: Marsa El Brega LNG Plant - Summary of Business Opportunity	381
Table 3.352: Investment Requirement in Libya's Transportation Infrastructure	381
Table 3.353: Total length paved and unpaved road in Libya.....	382
Table 3.354: Libya's Key Roadways	382
Table 3.355: Libya's Track Lengths	383
Table 3.356: Libya's Rail Network specification	383
Table 3.357: Libya's Airfield Types.....	383
Table 3.358: Libya's Cargo Ports.....	384
Table 3.359: Libya's Cargo Ports Development opportunities.. ..	386
Table 3.360: Summary of Capital Investment Associated with Libya's Power Generation Industry	386
Table 3.361: Libya's Power Generation Plants	387
Table 3.362: Libya's Development of Produced Power and Peak Load (1996 – 2004)	387
Table 3.363: Libya's Projected Power Demand.....	387
Table 3.364: Libya's Proposed Power Plants	388
Table 3.365: Libya's Electricity Transmission Sector - Summary of Business Opportunity	389
Table 3.366: Libyan Local Contracting Firms.....	389

Index

Basin

Cyrenaica, 11, 13, 15, 18, 19, 20, 29, 30, 32, 34, 39, 40, 43, 49, 50, 275, 276, 277, 279, 331

Ghadames, 13, 15, 18, 19, 20, 29, 30, 32, 34, 38, 42, 49, 50, 202, 211, 216, 217, 218, 224, 225, 226, 235, 236, 238, 239, 240, 255, 310, 311, 312, 314, 315, 316, 317, 320, 323, 337

Kufra, 11, 13, 15, 18, 19, 20, 29, 30, 32, 34, 40, 44, 49, 50, 278, 279, 332

Murzuk, 13, 15, 18, 19, 20, 23, 29, 30, 32, 34, 38, 42, 49, 50, 208, 209, 227, 235, 236, 241, 242, 246, 247, 252, 253, 256, 257, 258, 259, 272, 275, 278, 317, 320, 337, 351, 352, 367

Offshore/Tripolitania, 13, 15, 18, 19, 20, 29, 30, 32, 34, 39, 43, 49, 50, 260, 261, 262, 267, 268, 269, 270, 271, 272, 273, 274, 321, 322, 323, 326, 327, 328, 329, 330

Sirte, 13, 15, 18, 19, 20, 25, 29, 30, 32, 34, 36, 38, 41, 49, 50, 53, 54, 56, 58, 63, 65, 72, 168, 194, 195, 196, 198, 200, 207, 208, 209, 210, 211, 212, 214, 215, 235, 236, 238, 272, 273, 282, 283, 284, 301, 302, 303, 304, 337, 362, 364

Commodity

Ammonia, 24, 25, 346, 369, 370, 371

Benzene, 24, 352, 369, 372, 373

Butadiene, 24, 352, 370, 372, 373

Butene-1, 24, 370, 373

Ethane, 373, 376, 377, 378, 380

Ethylene, 24, 369, 372

Ethylene dichloride, 24, 369, 372

Fuel Gas, 24, 294, 344, 370, 373, 379

Gas, 26, 27, 265, 350, 374, 375, 376, 377, 378, 379

Gasoline, 354, 355, 356, 358, 359, 360, 361, 362, 363, 365, 366, 367, 368, 369, 376, 377, 378, 380

HDPE, 24, 369, 372

Hydrocarbon feed stocks, 24, 369, 373

LLDPE, 24, 369, 372

LNG, 26, 27, 143, 210, 284, 297, 362, 378, 379, 380, 381

Methanol, 24, 25, 346, 369, 370, 371, 373

Methyl Tertiary Butyl Ether, 24, 355, 356, 361, 369, 373

Oil, 23, 53, 54, 58, 60, 195, 196, 200, 216, 218, 224, 225, 226, 241, 243, 252, 254, 260, 262, 267, 269, 282, 283, 284, 301, 302, 303, 310, 311, 312, 314, 315, 316, 317, 321, 322, 326, 327, 328, 338, 344, 350, 351, 367

Polyethylene, 24, 369, 372, 373

Polypropylene, 24, 369, 373

Polyvinyl Chloride, 24, 25, 369, 370, 372

Propylene, 24, 369, 372

Pyrolysis Gasoline, 24, 369, 372

Urea, 24, 25, 346, 369, 370, 371

Vinyl Chloride Monomer, 24, 369, 372

Infrastructure

Airports, 12, 27, 381, 382, 383, 384

Electricity Transmission, 389

Ports, 27, 381, 382, 384, 386

Benghazi, 385, 386

Derna, 384, 385, 386

Khoms, 385

Marsa El Brega, 384, 385

Qasr Ahmed (Misurata), 384, 385

Ras Lanuf, 384, 385, 386

Tobruk, 384, 385

Tripoli, 384, 385, 386

Zuara, 384, 385, 386

Zueitina, 384, 385



Power Generation, 25, 27, 28, 357, 362, 369, 386, 387, 388

Railway, 12, 27, 381, 383

Roads, 12, 27, 381, 382

International Energy Group

Al Ghurair Investments, 23, 357

Edison International, 214, 375

ETA Ascon Star Group, 23, 357

Star Petro Energy, 23, 357

TransAsia Gas International, 23, 357

International Oil Company

Addax, 213

Agip (ENI), 22, 87, 89, 153, 154, 155, 193, 213, 243, 245, 264, 270, 273, 278, 313, 324, 329, 332, 345

Amerada Hess, 77, 78, 81, 92, 93, 95, 113, 115, 165, 182, 184, 186, 187, 210, 296, 307

BG, 210, 212, 278, 279

BP, 133, 134, 167, 168, 212

Bridas Corporation, 213

Burren Energy, 214

Centrica Energy, 214

Chevron, 212, 257

Chinese Petroleum, 258

CNPC, 233, 273

ConocoPhillips, 77, 78, 81, 92, 93, 95, 113, 115, 165, 182, 184, 186, 187, 213, 296, 307

Daesung, 245

Dow Chemical Co., 373

E.ON Ruhrgas, 214

Essar Group, 227, 255

ExxonMobil, 60, 67, 96, 104, 106, 110, 119, 127, 130, 143, 148, 151, 161, 162, 173, 178, 188, 190, 211, 212, 213, 276, 289, 297, 378, 379

Gaz De France, 213, 375

Gazprom, 210, 211, 213, 239

Hellenic Petroleum, 211, 214, 236

Hess, 213

Husky, 171

Hyundai, 245, 373

INA, 214

Indian Oil, 239

Indian Oil Corporation Ltd, 211, 214

Inpex, 213, 258, 276

Itochu Corporation, 214

Japan Petroleum Exploration Co. Ltd, 214

Japex, 258, 276

JOGMEC, 214

Korea Gas Corporation, 214

Lasmo, 243, 244

Liwa, 209, 211, 257, 275

LUKoil, 213

Maersk, 213

Majuko Enterprise, 245

Marathon, 77, 78, 81, 92, 93, 95, 113, 115, 165, 182, 184, 186, 187, 213, 296, 307

Medco, 233, 237

Mitsubishi Corporation, 214, 238, 273, 276

Mitsui, 214

MOL, 214

Mubadala Development, 214

Naftogaz Ukrainy, 213

Nippon Oil Exploration Ltd, 214, 273, 276

Norsk Hydro, 258

Novatek JSC, 213

Oasis, 77, 78, 80, 90, 92, 93, 94, 113, 114, 115, 119, 137, 164, 165, 182, 183, 185, 187, 278, 332

Occidental, 63, 65, 72, 73, 108, 109, 122, 124, 137, 156, 157, 159, 160, 188, 189, 209, 210, 211, 213, 214, 257, 275, 375, 376, 377

Oil India, 239



Oil India, 210, 211, 214

OMV, 171, 211, 213, 248, 251, 257, 258, 273

ONGC Videsh, 213, 238, 273, 276

Pakistan Petroleum Ltd, 213

Pan American, 161, 162, 213

Pertamina, 210, 273

Petrobras, 213, 272

Petro-Canada, 61, 68, 69, 97, 101, 102, 103, 105, 107, 111, 112, 120, 129, 146, 151, 174, 191, 204, 205, 213, 305

Petrom, 246

Petronas Carigali, 213

Polskie Gornictwo Naftowe i Gazownictwo (PGNiG), 213, 259

PTTEP, 213

Repsol, 26, 211, 213, 236, 246, 248, 250, 251, 257, 258, 273, 379

RWE Dea, 212, 213, 276

Saga Petroleum Mabruk (Norsk Hydro), 36, 131, 251, 257

Shell, 26, 70, 210, 213, 214, 380, 381

SK Energy, 215, 245

Statoil, 213, 276, 278, 279

Talisman, 213

Tatneft, 211, 238

Teikoku, 238

Total, 99, 100, 130, 131, 213, 248, 251, 257, 266, 269, 270, 276, 329

Turkish Petroleum, 258

Union Fenosa, 214

Veba Oil Operations B.V. (Petro-Canada), 68, 97, 105, 107, 112, 129, 191

Verenex, 228, 233, 234, 237, 239

Waha, 77, 78, 80, 81, 90, 92, 93, 95, 113, 165, 183, 184, 186, 193, 194, 294, 295, 296, 307, 346

Wintershall, 74, 75, 76, 116, 117, 140, 175, 176, 193, 213, 266, 270, 279, 329

Woodside, 209, 210, 211, 213, 236, 317, 318

Local Contractor

A T International, 389

Al Baraka Oilfield Services, 389

Al Enmaa Oilfield Services, 389

Al Motawaset for Oilfield Services, 389

Alpha Oil Field Services, 389

Atlas Oilfield Services, 389

Bosna-S Oil Services Co., 389

CSI (Group) Oilfield Services, 389

DAAM Co., 389

Dolphin Oilfield Services, 389

NAPSC, 389

Petrolibya Oilfield Services, 389

RS Libya – Baida Co., 389

SABEEL Company, 389

TeCo BH, 389

VAOS Limited, 389

Wadi Temsikt, 389

Non-associated Gas Field

3L1-11, 303

Al Atshan, 42, 315, 316, 317, 318, 319, 320

Al Wafaa, 42, 310, 311, 312, 313, 314, 323, 337, 375

As Sahel, 41, 282, 283, 284, 285, 286

As Surah, 41, 282, 283, 284, 287, 288

Assumud, 41, 282, 283, 284, 289, 290, 291

Attahaddy, 41, 282, 283, 284, 291, 292, 293, 380

Bahr Essalam, 43, 262, 312, 321, 322, 323, 324, 325, 328, 375

Barrut I, 42, 302, 303, 304, 305, 306

C-NC 35A, 327, 328

D-NC 41, 327, 328

E-NC 137, 328



E-NC 41, 327, 328
 Faregh, 41, 282, 283, 284, 294, 296, 297, 344
 G-NC 41, 327, 328
 Hateiba, 41, 282, 283, 284, 297, 298, 299
 H-NC 41, 327, 328
 K-NC 41, 327, 328
 Meghil, 41, 282, 283, 284, 299, 300, 301, 380
 M-NC 41, 327, 328
 NC 98-A, 42, 302, 303, 304, 306, 307
 P-NC 41, 327, 328
 Tabit, 42, 302, 303, 304, 307, 308, 309

Oil Field

3U-59, 198, 206
 4T-59, 198, 206
 A-137, 268, 269
 Abraq, 198, 206
 Abu Amud, 198, 206
 Abu Maras, 36, 53, 56, 58, 60, 61, 62
 Abu Quray, 37, 196, 198, 200, 201, 202
 Al Jurf, 39, 260, 261, 262, 265, 266, 267, 269, 270
 Al Kabir, 38, 216, 217, 218, 221, 222, 223
 Al Kuf, 56, 193
 Ali, 36, 53, 56, 58, 63, 64, 73
 Almas, 36, 53, 56, 58, 65, 66, 73
 Amal, 37, 50, 53, 56, 58, 67, 68, 69, 113
 A-NC 107, 198, 206
 A-NC 125, 56, 193
 A-NC 41, 268, 269
 A-NC 74F, 198, 206
 Antlat, 37, 53, 56, 58, 70, 72
 Arbab, 37, 53, 56, 58, 72, 73, 74
 Area 47 Group, 228
 Arshad, 56, 193

As-Sarah, 37, 53, 56, 58, 74, 75, 76, 343, 350
 Aswad, 56, 193
 Augila, 37, 53, 56, 59, 83, 134, 136, 137, 138, 150, 169, 203, 289, 306
 Ayn Jarbi, 56, 193
 Bahi, 25, 37, 53, 56, 58, 77, 78, 79, 374
 Balat, 37, 53, 56, 58, 80, 81, 82
 Barrut N, 198, 206
 Barrut T, 198, 206
 Bazzuzi, 198, 206
 Beda, 37, 53, 56, 58, 82, 83, 84, 134, 137, 169, 202, 203
 Beda South, 37, 84, 196, 198, 200, 202, 203
 Bilhizan, 56, 193
 B-NC 171, 56, 193
 B-NC137, 268, 269
 Bouri, 39, 260, 261, 262, 263, 264, 265, 269, 273, 323, 338, 343
 Bu Alawn, 53, 56, 58, 85, 86, 87
 Bu Attifel, 25, 37, 53, 56, 58, 87, 88, 89, 90, 136, 153, 284, 306, 374
 C-137, 268, 269
 Chadar, 198, 206
 Choboc, 198, 206
 C-NC 41, 268, 269
 C-NC 98, 56, 193
 C-NC137, 268, 269
 D-137, 268, 269
 Daba, 56, 193
 Dafa, 94
 Dahra, 37, 53, 56, 58, 90, 91, 92, 93, 119
 DDD-59, 198, 206
 Defa, 25, 37, 53, 56, 59, 93, 94, 95, 374
 D-NC 171, 56, 193
 Dor Mansour, 56, 193



Dor Marada, 37, 53, 59, 127, 128
 E-137, 268, 269
 E-92, 198, 206
 Ed Dib, 37, 53, 56, 59, 96, 97, 98, 104, 110, 190
 EE-80, 198, 206
 El Sharara, 21, 38, 241, 242, 243, 246, 247, 248, 249, 257, 333, 337, 338
 Elephant, 21, 38, 241, 242, 243, 244, 245, 333, 337
 El-Meheiriga, 37, 53, 56, 59, 99, 100
 Emghayet, 217, 218
 En Naga, 37, 53, 56, 59, 101, 102, 103, 104, 204, 337
 En Naga A, 37, 196, 198, 200, 203, 204, 205
 E-NC 35A, 268, 269
 Eteila, 56, 193
 F-137, 268, 269
 Facha, 37, 53, 56, 59, 104, 105, 106, 110, 145, 190
 Farigh, 56, 193
 Farrud, 37, 53, 56, 59, 106, 107, 108, 178
 Fidda, 37, 53, 56, 59, 108, 109, 110
 F-NC 41, 268, 269
 Gattar, 198, 206
 Ghani, 37, 53, 56, 59, 96, 104, 110, 111, 112, 190
 Ghziel, 217, 221
 Gialo, 37, 53, 56, 59, 113, 114, 115, 285, 294, 344
 G-NC 35A, 268, 269
 Hakim, 56, 193
 Hamada, 21, 38, 83, 134, 137, 169, 203, 216, 217, 218, 219, 220, 221, 223, 227, 232, 233, 333, 358
 Hamid, 37, 53, 56, 59, 116, 117, 118, 175
 Haram, 198, 206
 Harash, 56, 193
 HH-80, 198, 206
 Hofra, 37, 53, 56, 59, 90, 119, 120, 121
 Intisar, 26, 37, 53, 56, 59, 89, 99, 122, 123, 124, 125, 161, 170, 209, 294, 306, 374, 375, 376
 Jakhira, 56, 193
 Jebel, 56, 193
 K-137, 268, 269
 Karim, 198, 206
 Khalifah, 56, 193
 Khatib, 37, 54, 56, 60, 153, 154, 155
 Khatt, 198, 206
 KK-80, 198, 206
 Kotla, 37, 53, 56, 59, 125, 126, 127
 L-51, 198, 206
 Lehib, 37, 53, 56, 59, 127, 128, 129
 Libba, 198, 206
 Mabruk, 37, 53, 56, 59, 130, 131, 132
 Majid, 56, 193
 Majid N, 56, 193
 Masrab, 56, 193
 Messla, 37, 53, 56, 59, 83, 133, 134, 135, 137, 169, 203, 352, 353
 Meulagh, 56, 193
 MM-82, 198, 206
 Nafoora, 37, 53, 56, 59, 83, 134, 136, 137, 138, 150, 169, 203, 306, 343
 Nafoora-Augila, 88
 Nakhla, 37, 53, 56, 59, 139, 140, 141, 175
 Nasser, 37, 50, 53, 59, 67, 142, 144, 145, 179, 284, 287, 299, 380
 Nasser, 56
 Nasser, 143
 NC 101, 39, 252, 253, 254
 NC 186, 38, 241, 242, 243, 247, 249, 250, 251
 NN-47, 198, 206



North Ghziel, 217, 221
 Northern Group, 38, 224, 225, 226, 227, 228, 234
 O-80, 198, 206
 P-71, 56, 193
 Qusur, 37, 54, 56, 59, 145, 146, 147
 Raguba, 37, 54, 56, 59, 147, 148, 149, 380
 Rakb, 37, 54, 56, 60, 150, 151, 152
 Rimal, 37, 54, 56, 60, 88, 153, 154, 155
 RR-59, 56, 194
 RR-71, 56, 194
 Sabah, 37, 54, 56, 60, 156, 157, 158, 162
 Safsaf, 37, 54, 56, 60, 159, 160, 161
 Sahabi, 37, 54, 56, 60, 161, 163, 166
 Samah, 37, 54, 56, 60, 80, 102, 164, 165, 337
 Sarir, 37, 54, 56, 60, 83, 113, 134, 137, 167, 168, 169, 170, 203, 275, 352, 353, 364
 Shatirah, 37, 54, 56, 60, 170, 171, 172
 T1-82, 198, 206
 T-80, 198, 206
 Tagrifat, 56, 194
 Themar, 198, 206
 Tibisti, 37, 54, 56, 60, 172, 173, 174
 Tuama, 37, 54, 56, 60, 175, 176, 177
 U-59/4, 56, 194
 Umm Al Farrud, 37, 54, 56, 60, 106, 178, 179
 UU-80, 56, 194
 V-59, 56, 194
 Wadi, 37, 54, 56, 60, 179, 180, 181, 182
 Waha, 37, 54, 56, 60, 182, 183, 184, 185
 Warid, 198, 206
 Y-59, 198, 206
 YY-59/4, 56, 194
 Zaaum, 198, 206

Zaggut, 37, 54, 56, 60, 185, 186, 187
 Zella, 37, 54, 56, 60, 188, 189, 190
 Zelten, 143
 Zenad, 37, 54, 56, 60, 104, 190, 191, 192

Petrochemicals

Abu Kammash, 24, 25, 369, 370, 371, 372
 Marsa El Brega, 24, 25, 284, 297, 343, 369, 370, 371
 Ras Lanuf, 24, 25, 343, 369, 370, 371, 372, 373

Ra refinery

Sarir, 353

Refinery

Marsa El Brega, 23, 88, 142, 291, 297, 351, 352, 362, 363
 Ras Lanuf, 23, 351, 352, 353, 354, 355, 357, 359, 362, 363, 365
 Sabha (Murzuk), 23, 24, 351, 352, 367, 368, 369
 Sarir, 23, 24, 351, 352, 366
 Tobruk, 23, 275, 351, 352, 364, 365
 Zawia, 23, 223, 227, 243, 351, 352, 357, 358, 359, 360, 362, 363, 365

State Oil Company

AGOCO (Arabian Gulf Oil Company), 83, 84, 86, 126, 133, 134, 137, 138, 162, 167, 169, 179, 193, 194, 203, 206, 219, 220, 222, 227, 237, 239, 364, 366
 Korea National Oil Corporation (KNOC), 243
 National Oil Corporation (NOC), 36, 41, 47, 48, 61, 78, 80, 81, 83, 86, 89, 92, 95, 97, 100, 102, 103, 105, 107, 112, 115, 120, 129, 131, 134, 137, 146, 151, 154, 157, 162, 165, 169, 171, 174, 183, 184, 189, 191, 194, 203, 204, 205, 207, 208, 209, 211, 219, 220, 221, 222, 223, 227, 233, 235, 236, 237, 238, 239, 243, 244, 245, 248, 251, 257, 264, 266, 270, 272, 273, 275, 285, 288, 290, 296, 298, 300, 305, 307, 312, 313, 324, 329, 338, 349,



350, 352, 354, 355, 357, 359, 367, 369,
373, 380, 381

SIPEX, 239

Sirte Oil Co. (SOC), 143, 148, 181, 193,
206, 284, 285, 288, 290, 292, 293, 297,
298, 300, 343, 347, 362, 380

Sonatrach, 213, 237, 238, 239, 312

Zueitina Oil Co. (ZOC), 64, 66, 73, 109,
123, 124, 157, 160, 189, 193, 211, 349

Terminals

Crude Oil

Es Sider, 22, 344, 345, 346

Marsa El Brega, 22, 26, 337, 343, 344,
345, 346, 347, 378

Marsa El Hariga (Tobruk), 22, 275, 344,
345, 347, 348

Ras Lanuf, 22, 150, 188, 344, 345, 347

Zawia, 22, 247, 249, 339, 344, 345, 349,
350

Zueitina, 22, 87, 344, 345, 348, 349

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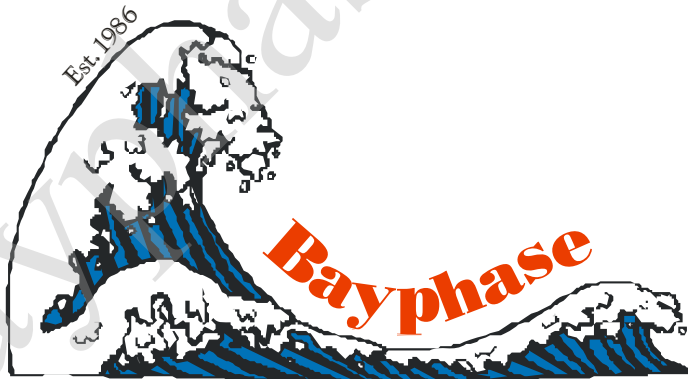
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