

# CONTENT

<b>1-</b>	<b>Introduction</b>	<b>01 of 05</b>
1.1-	Background of Project	01 of 05
1.2-	Existing Scenario	02 of 05
1.3-	Purpose of this ESIA Study	02 of 05
1.4-	Justification for ESIA Study	02 of 05
1.5-	Adopted Methodologies for ESIA	02 of 05
1.5.1-	Scoping Exercise	03 of 05
1.5.2-	Literature Reviews	03 of 05
1.5.3-	Surveys	03 of 05
1.5.4-	Monitoring & Analysis	03 of 05
1.5.5-	Identification of Aspects	03 of 05
1.5.6-	Assessment of Anticipated Impacts	03 of 05
1.5.7-	Preventive Measures & EMP	03 of 05
1.5.8-	Documentation & Review	04 of 05
1.6-	Organisation of this Report	04 of 05
1.7-	ESIA Team	04 of 05
<b>2-</b>	<b>Description of Project</b>	<b>01 of 28</b>
2.1-	Salient Features of Project	01 of 28
2.2-	Project Justification	01 of 28
2.3-	Objective of Project	03 of 28
2.4-	Project Location	03 of 28
2.5-	Description of Alternatives	05 of 28
2.5.1-	Technology Alternatives	05 of 28
2.5.2-	Deep Water Port	06 of 28
2.5.3-	Land Based LNG Terminal	06 of 28
2.5.4-	Dockside Option	07 of 28
2.5.5-	Location Alternatives	07 of 28
2.5.6 -	Fuel Alternatives	07 of 28
2.6-	Magnitude of Project	09 of 28
2.7-	Project Completion Schedule	09 of 28
2.8-	Project Components	09 of 28
2.8.1-	Marine Structures	09 of 28
2.8.2-	Pipelines	09 of 28
2.9-	Processes & Operations	09 of 28
2.9.1-	Facilities Platform	09 of 28

2.9.2-	LNG Carriers	11 of 28
2.9.3-	Pipelines	11 of 28
2.9.4-	Dredging	11 of 28
2.9.5-	Functionality of the Facility	11 of 28
2.9.6-	Supply Feed Conditions	11 of 28
2.10-	Available Utilities and Services	11 of 28
2.11-	Process Description	12 of 28
2.11.1-	LNG/LPG Process	12 of 28
2.11.2-	Onshore Storage Facility	13 of 28
2.11.3-	LPG Storage Tanks	13 of 28
2.11.4-	Vent System	14 of 28
2.11.5-	Water Sprinkler System	15 of 28
2.11.6-	LPG Truck & Bottle Loading	15 of 28
2.11.7-	Odorant Injection Package	15 of 28
2.11.8-	Fire Water System	16 of 28
2.11.9-	Fresh Water Supply	16 of 28
2.11.10-	Surface Drainage	16 of 28
2.11.11	Sewerage System	16 of 28
2.11.12-	Compressed Air	16 of 28
2.12-	Process Support Systems	16 of 28
2.12.1-	Pressure Control Station	16 of 28
2.12.2-	Export Gas Heating	16 of 28
2.12.3-	Metering Station	16 of 28
2.12.4-	Vapour Compressor	17 of 28
2.13-	Utility Systems	17 of 28
2.13.1-	Instrument Air	17 of 28
2.13.2-	Nitrogen	17 of 28
2.14-	Electrical Systems	17 of 28
2.14.1-	Power Generation	17 of 28
2.14.2-	Switchgear/MCC	17 of 28
2.14.3-	Lighting	17 of 28
2.14.4-	Emergency Power	17 of 28
2.14.5-	Process Control	17 of 28
2.15-	Disposal of Dredged Waste and Land Reclamation	17 of 28
2.16-	Summary of Project Components	17 of 28
2.16.1-	Main Jetty	18 of 28
2.16.2-	Pipelines System	18 of 28
2.16.3-	Shore Buildings/Structures at Jetty Services Area	18 of 28

2.16.4-	Shore-side/Land Installations	18 of 28
2.16.5-	Design Parameters	18 of 28
2.16.6-	Dredging Requirements	18 of 28
2.17-	Risk Mitigation	18 of 28
2.17.1-	Overview	18 of 28
2.17.2-	Element of Safety in the Design of Project Facilities	18 of 28
2.17.3-	Profile	19 of 28
2.17.4-	Hull System	19 of 28
2.17.5-	Containment System	19 of 28
2.17.6-	LNG Properties & Potential Hazards	21 of 28
2.17.7-	Pressure and Temperature Control	23 of 28
2.17.8-	Propulsion System	23 of 28
2.17.9-	Ballast Tanks	23 of 28
2.17.10-	Ship Safety Systems	24 of 28
2.17.11-	Fire Protection	24 of 28
2.17.12-	Unloading Operations	24 of 28
2.17.13-	Terminal Operations	24 of 28
2.17.14-	Likelihood of Tanker Collisions	25 of 28
2.18-	Sandia Report	25 of 28
2.19-	Types of LNG Hazards	27 of 28
2.19.1-	Explosion	27 of 28
2.19.2-	Vapor Clouds	27 of 28
2.19.3-	Freezing Liquid	27 of 28
2.19.4-	Rollover	27 of 28
2.19.5-	Rapid Phase Transition	27 of 28
<b>3-</b>	<b>Regulatory Requirements</b>	<b>01 of 09</b>
3.1-	Policies and Plans	01 of 09
3.1.1-	National Conservation Strategy	01 of 09
3.1.2-	Biodiversity Action Plan	01 of 09
3.1.3-	LNG Policy	01 of 09
3.1.4-	Maritime Policy of Pakistan	01 of 09
3.2-	National Laws and Guidelines	02 of 09
3.2.1-	Pakistan Environmental Protection Act 1997	02 of 09
3.2.2-	Pakistan Environmental Protection Agency Review of and EIA Regulations 2000	02 of 09
3.2.3-	Port Qasim Authority Act, 1973 (Modified in 2002)	02 of 09
3.2.4-	National Environmental Quality Standards (NEQS)2001	03 of 09

3.2.5-	Antiquities Act 1975	03 of 09
3.2.6-	Forest Act 1927	03 of 09
3.2.7-	Ports Act 1908 and Pakistan Territorial Waters and Maritime Zones Act 1976	03 of 09
3.2.8-	EIA Guideline Package of Pakistan Environmental Protection Agency	04 of 09
3.2.9-	Self-monitoring and Reporting Rules 2001	04 of 09
3.3-	International Conventions & Guidelines	04 of 09
3.3.1-	MARPOL 1973 (Modified in 1978)	04 of 09
3.3.2-	London Convention 1972	05 of 09
3.3.3-	IUCN Red List	05 of 09
3.3.4-	Laws of Seas	05 of 09
3.3.5-	International Convention on Biodiversity	05 of 09
3.3.6-	World Bank Guidelines on Environment	05 of 09
3.3.7-	IFC Guidelines	06 of 09
3.3.8-	LNG Regulations	06 of 09
3.3.9-	Equator Principles	08 of 09
3.3.10-	IFC Performance Standards on Social & Environmental Sustainability	09 of 09
<b>4-</b>	<b>Baseline of Respective Area</b>	<b>01 of 53</b>
4.1-	Physical Environment	01 of 53
4.1.1-	Cilmate	01 of 53
4.1.2-	Hydrodynamics of Karachi Coast	07 of 53
4.1.3-	Geomorphology	09 of 53
4.1.4-	Geology	10 of 53
4.1.5-	Coastal Geology and Geomorphology	10 of 53
4.1.6-	Stratigraphy and Lithology	11 of 53
4.1.7-	Seismic Information	12 of 53
4.1.8-	Tsunami	13 of 53
4.1.9-	Soil	13 of 53
4.2-	Hydrology and Hydrogeology	13 of 53
4.2.1-	Impact of River Discharge	13 of 53
4.2.2-	Sources of Water Pollution	14 of 53
4.2.3-	Physio-Chemical Conditions of Creek System	16 of 53
4.2.4-	Nutrient Concentration	17 of 53
4.2.5-	Heavy Metals in Sea Water and Marine Sediments	19 of 53
4.3-	Creek System Hydraulics	20 of 53
4.3.1-	Port Qasim Entrance and Navigation Channels	20 of 53

4.3.2-	Tides and Currents	20 of 53
4.4-	Ecological Environment	20 of 53
4.4.1-	Coastal & Marine Ecosystem	20 of 53
4.4.2-	Marine/Aquatic Life	20 of 53
4.4.3-	Fisheries	28 of 53
4.4.4-	Avifauna of Karachi and Indus Delta	28 of 53
4.4.5-	Marine Mammals	29 of 53
4.4.6-	Endangered Species	29 of 53
4.4.7-	Mangrove Ecosystem	31 of 53
4.5-	Survey on Benthic Ecology of Port Qasim	33 of 53
4.5.1-	Overview	33 of 53
4.5.2-	Benthic Marine Habitats in PQA	34 of 53
4.5.3-	Marine Flora	34 of 53
4.5.4-	Marine & Fauna	35 of 53
4.5.5-	Result of Marine Benthic Survey	37 of 53
4.5.6-	Suspended Matter	38 of 53
4.5.7-	Coastal Mudflat Habitats	41 of 53
4.5.8-	Fishery in the PQA	43 of 53
4.6-	Ambient Air and Noise Quality	49 of 53
4.7-	Archaeological and Historical Sites	50 of 53
4.8-	Landuse and Developments in the Area	50 of 53
4.8.1-	Port Qasim Authority	51 of 53
4.8.2-	Coastal Area Development Plan	51 of 53
4.8.3-	Land Use in Adjoining Area	52 of 53
4.9-	Socio-Economic Conditions	52 of 53
4.9.1-	Human Settlements	52 of 53
4.9.2-	Employment and Living Conditions	52 of 53
4.9.3-	Dependence on Mangroves	53 of 53
<b>5-</b>	<b>Socio-Economic Assessment &amp; Baseline</b>	<b>01 of 06</b>
5.1-	Introduction	01 of 06
5.2-	Objectives of the Study	01 of 06
5.3-	Socio-economic Scenario in Brief	01 of 06
5.4-	Scope of Socio-economic Study	02 of 06
5.5-	Methodology for Socio-economic Assessment	02 of 06
5.5.1-	Transect Walk/Direct Observation	03 of 06
5.5.2-	Semi-Structured Interviews	03 of 06
5.6-	Socio-economic Aspects	03 of 06
5.6.1-	Prosperity Rating	04 of 06

5.6.2-	Goth Ali Mohammad Khaskhaily	04 of 06
5.6.3-	Baseline Studies	04 of 06
5.7-	Project and the Community	05 of 06
5.7.1-	Administrative Set-up	05 of 06
5.7.2-	Social Makeup	05 of 06
5.7.3-	Occupations	05 of 06
5.7.4-	Fishing Community	05 of 06
5.7.5-	Education	06 of 06
5.7.6-	Sanitary Conditions	06 of 06
5.7.7-	Health	06 of 06
5.7.8-	Needs of the Community	06 of 06
<b>6-</b>	<b>Stakeholder interaction (Consultation &amp; Disclosure Plan)</b>	<b>01 of 14</b>
6.1-	Public Consultation and Participation	01 of 14
6.2-	PGPL's Policy of Public Consultation and Disclosure Plan	01 of 14
6.3-	Identification of Stakeholders	03 of 14
6.4-	Methods and Approach	03 of 14
6.5-	Results of Consultation at the Planning Stage	05 of 14
6.6-	Ongoing Community Engagement Plan for Construction and Operation Phases	05 of 14
6.6.1-	Community Engagement Responsibilities	08 of 14
6.6.2-	Training on Community Relations	10 of 14
6.6.3-	Grievance Management	10 of 14
6.6.4-	Performance Indicators	11 of 14
<b>7-</b>	<b>Screening of Anticipated Impacts and Proposed Mitigations</b>	<b>01 of 39</b>
7.1-	Environmental Mitigation Goals	01 of 39
7.1.1-	Short/Near Term Goals	01 of 39
7.1.2-	Long Terms Goals	02 of 39
7.2-	Impacts at Design Stage	02 of 39
7.2.1-	Project Siting	02 of 39
7.3-	Physical Impacts During Construction & Operations	02 of 39
7.3.1-	Noise due to LNG Terminal, Pipeline & Land Facilities	02 of 39
7.3.2-	Project Impact on Air Quality	04 of 39
7.3.3-	Impacts on Maritime Navigation	19 of 39
7.3.4-	Impacts on Geology, Geomorphology & Hydrogeology	20 of 39
7.3.5-	Hydrological Impacts	21 of 39
7.4-	Impacts of Ecology	27 of 39
7.4.1-	Terrestrial Ecology	27 of 39

7.4.2-	Mangroves	28 of 39
7.4.3-	Marine Ecology	28 of 39
7.5-	Socioeconomic Impacts	33 of 39
7.5.1-	Site Selection and Resettlement Issues	34 of 39
7.6-	Cummulative Environmental and Social Impacts	36 of 39
<b>8-</b>	<b>Environmental Management Plan</b>	<b>01 of 53</b>
8.1-	Introduction	01 of 53
8.1.1-	PGPL's Commitment to Environment, Health and Safety	01 of 53
8.1.2-	Purpose of the EMP	02 of 53
8.1.3-	Scope of the EMP	02 of 53
8.1.4-	Organization of the EMP	03 of 53
8.1.5-	Maintenance of the EMP	03 of 53
8.2-	Health & Safety	03 of 53
8.2.1-	Environmental Health and Safety Management System	03 of 53
8.2.2-	Worker Health and Safety Plan	04 of 53
8.2.3-	Emergency Response Plan	04 of 53
8.3-	Responsibilities, Training and Communication	14 of 53
8.3.1-	Responsibilities	14 of 53
8.3.2-	Training	20 of 53
8.3.3-	Communications	24 of 53
8.4-	Regulatory Requirements	25 of 53
8.4.1-	Approvals, Authorisations and permits	25 of 53
8.4.2-	Environmental Quality Objectives	25 of 53
8.4.3-	Compliance Monitoring	25 of 53
8.5-	Standard Operating Procedures	25 of 53
8.5.1-	Barge and Supply Ship Operations	25 of 53
8.5.2-	Watercourse Crossings	26 of 53
8.5.3-	Wastewater/Storm water Management	27 of 53
8.5.4-	Hydrostatic Testing	32 of 53
8.5.5-	Noise and Air Emissions	34 of 53
8.5.6-	Erosion Protection Requirements	35 of 53
8.5.7-	Cleanup and Re-vegetation	36 of 53
8.5.8-	Waste Management Plan	38 of 53
8.5.9-	Environmental Monitor/Inspector	41 of 53
8.6-	Contingency Planning Accidents & Malfunctions	44 of 53
8.6.1-	Fire Contengency Plan	44 of 53
8.6.2-	Hazardous Spill Contingency Plan	46 of 53
8.6.3-	Housekeeping	48 of 53

8.6.4-	Security	48 of 53
8.6.5-	Training	48 of 53
8.6.6-	Fire Detection and Warning	48 of 53
8.6.7-	Site Accommodation	49 of 53
8.6.8-	Fire Drills	49 of 53
8.6.9-	Material Storage	49 of 53
8.6.10-	Fire Fighting Equipment	49 of 53
8.6.11-	Training	50 of 53
8.7-	Environmental Compliance	50 of 53
8.7.1-	Audits	51 of 53
8.7.2-	Site Internal Environmental Audits	51 of 53
8.7.3-	Environmental Management Systems Audits	51 of 53
<b>9-</b>	<b>Conclusion</b>	<b>01 of 01</b>