Environmental extracts from:-

Qatargas II Project

Milford Haven Marine

Concept Risk Assessment

9-10 December, 2002

Risk Matrix

PROBABILITY

	A	B	C	D	E
I	1	1	1	2	2
II	1	1	2	2	2
III	1	2	2	3	3
IV	2	3	3	3	3

Probability Definitions

Category	Definition	Working Definition
A	Possibility of Repeated Incidents	20 or more times per facility life o 5 or more times during Project/D&C
B	Possibility of Isolated Incidents	5 times in facility life or once during PROJECT/D&C
C	Possibility of Occurring Sometime	Once in facility life cycle or 10% likelihood during PROJECT/D&C
D	Not Likely to Occur	10% likelihood of occurring once in facility life or 1% likelihood during PROJECT/D&C
E	Practically Impossible	Once in 100 or more facility lives or 0.1% likelihood during PROJECT/D&C

Consequence Considerations

Consequence Category	CONSIDERATIONS			
	Health/Safety	Public Disruption	Environmental Impact	Financial Impact
I			*Major/Extended Duration/Full-Scale Response* Requires corporate assistance and picked up by national/international media.	
II			*Serious/Significant Resource Commitment* Oil spill response, communicated by media.	
III			*Moderate/Limited Response of Short Duration* Oil spill response, communicated by media.	
IV			*Minor/Little or No Response Needed*	

Risk Scenario Worksheet

Hazard Scenario No. 1:

Risk Matrix

	A	B	C	D	E
I					
II					
III					
IV	E(B)			E,F(A)	

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:
Import LNG ship break out from berth

Risk Scenario Worksheet
Hazard Scenario No. 2

Risk Matrix

	A	B	C	D	E
I					
II				E	
III					
IV					

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:
Collision outside port jurisdiction or in approach to pilot station resulting in cargo or bunker release

Risk Scenario Worksheet

Hazard Scenario No. 3:

Risk Matrix

	A	B	C	D	E
I				E	
II					
III					
IV					

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:
LNG ship enters West Channel during period of changeover of transverse tidal flow. Ship grounds on shoal area at channel entrance. Hull damage sustained. No cargo release, possible bunker release

Risk Scenario Worksheet

Hazard Scenario No. 4:

Risk Matrix

	A	B	C	D	E
I				E	
II					
III					
IV					

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:

LNG vessel loses engine or rudder capacity in West Channel. Vessel grounds similar consequences to scenario 3. No cargo release, possible bunker release

Risk Scenario Worksheet

Hazard Scenario No. 5:

Risk Matrix

	A	B	C	D	E
I					
II					
III					
IV			E		

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:

LNG vessel manoeuvring to swing West of Esso buoy, or while backing towards, berth, control loss results in collision with berth. Scenario also includes possibility of grounding following loss of control in swinging area. No breach of hull. No cargo release

Risk Scenario Worksheet

Hazard Scenario No. 6:

Risk Matrix

	A	B	C	D	E
I					
II					
III					
IV			E		

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:

LNG vessel manoeuvring to swing West of Esso buoy, or while backing towards berth, control loss results in collision with LNG vessel berthed at jetty. Does not result in breakout, just berthed vessel transverse movement, structural damage to both vessels. No cargo or bunker release due to low impact velocity

Risk Scenario Worksheet

Hazard Scenario No. 7:

Risk Matrix

	A	B	C	D	E
I				E	
II					
III					
IV					

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:

LNG vessel en-route to Milford Shelf swinging ground impacts vessel on TFE or ChevronTexaco jetties with sufficient energy/impact angle to puncture single hull. Pollution (200 tonnes) black oil to water. (Fire, physical injury as possible results with lower probability)

Risk Scenario Worksheet

Hazard Scenario No. 8:

Risk Matrix

	A	B	C	D	E
I					
II				E	
III					
IV					

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:

Fishing vessel collision with pipeline on trestle. Rogue fishing vessel inbound from sea, passes North of channel, North of jetty T head and impacts trestle roadway. Damage to associated equipment. 30 tonne bunkers spilled

Risk Scenario Worksheet

Hazard Scenario No. 9:

Risk Matrix

	A	B	C	D	E
I					E
II					
III					
IV					

Legend

E = Environmental

B = Risk Before, A = Risk After

Scenario Description:

Unescorted passing vessel (possibly ferry) loses control and collides with berthed LNG vessel. LNG containment ruptured. LNG release. Vapour fire envelops passing ship and berthed LNG vessel. Multiple fatalities.

Risk Scenario Worksheet

Hazard Scenario No. 10:

Risk Matrix

	A	B	C	D	E
I					
II					
III					
IV	E				

Legend

E = Environmental

B = Risk Before. A = Risk After

Scenario Description:

Existing escort tug did not have optimum design characteristics, resulting in the inability to effectively control the LNG ship in an emergency.