



Application for Development Consent

Application Reference Number: WWO10001

Navigational Issues and Preliminary Risk Assessment

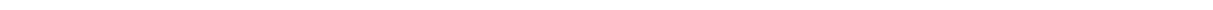
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King Edward Memorial Park Foreshore - Annexes: Hazard Logs

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in
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January 2013

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Annexes

List of annexes in order

Annex A: Hazard log introduction

Annex B: Most likely hazard log - Phase A: Construction of cofferdam

Annex C: Most likely hazard log - Phase B: Construction of drop shaft/ culvert/ connection

Annex D: Most likely hazard log - Phase C: Removal of Cofferdam

Annex E: Most likely hazard log - Phase D: Permanent work site

Annex F: Worst credible hazard log - Phase A: Construction of cofferdam

Annex G: Worst credible hazard log - Phase B: Construction of drop shaft/ culvert/ connection

Annex H: Worst credible hazard list - Phase C: Removal of Cofferdam

Annex I: Worst credible hazard log - Phase D: Permanent work site

Annex A – Hazard log introduction

A.1 Construction Phases

A.1.1 The assessment has been divided into 4 distinct project phases to allow for assessment of hazards and the proposal of risk reduction measures commensurate with the risk posed by different operations associated with the project. These are:

- Phase A - Construction of cofferdam
- Phase B - Construction of drop shaft/culvert/connections
- Phase C - Removal of cofferdam
- Phase D – Permanent works site.

A.2 Risk assessment criteria

A.2.1 **Risk Matrix** - The following risk matrix has been used to provide a risk score that combines severity of a particular consequence together with the probability of the consequence occurring.

Likelihood	1 - Rare	1	2	3	4	5
	2 - Unlikely	2	4	6	8	10
	3 - Possible	3	6	9	12	15
	4 - Likely	4	8	12	16	20
	5 - Almost Certain	5	10	15	20	25
Severity		Level 1	Level 2	Level 3	Level 4	Level 5

A.2.2 **Risk Classification** – The risk score indicates the magnitude and acceptability of the risk in accordance with the ALARP principle.

Score	Classification	Definition
1 - 2	Slight	No Action is required
3 - 4	Minor	No additional controls are required, monitoring is required to ensure no changes in circumstances
5 - 9	Moderate	Efforts should be made to reduce risk to 'As Low As Reasonably Practicable' (ALARP). Job can be performed under direct supervision of Senior Officer
10 - 14	High	Efforts should be made to reduce risk to 'As Low As Reasonably Practicable' (ALARP). Job can only be performed after authorisation from Harbour Master and after further additional

		controls required under the circumstances
15 - 25	Extreme	Intolerable risk. Job is not authorised

A.2.3 **Severity** – The criteria used throughout this assessment has been provided by the Port of London Authority. It identifies four distinct areas of risk with the probable consequences associated with each hazard assessed in terms of harm or loss to:

- People (life);
- Environment;
- Operational Impact, and;
- Media Attention.

People	Level
First aid case / Medical treatment case	1
Restricted work case	2
Lost Time Injury / Moderate permanent partial disability injury	3
Single Fatality / Severe permanent partial disability	4
Multiple fatalities	5

Operational Impact	Level
Insignificant or no damage to vessel / equipment	1
Minor or superficial damage to vessel / equipment	2
Moderate damage to vessel / equipment requiring immediate repairs	3
Major damage to vessel / equipment and detention	4
Very serious damage to vessel or equipment possible criminal proceedings	5

Environment	Level
Low impact with no lasting effect	1
Temporary effect / Minor effect to small area	2
Short to medium term impact	3
Medium to long term effect / large area affected	4
Long term impact / severe impact on sensitive area	5

Media Attention	Level
No Coverage	1
Local coverage	2
Regional coverage	3
National coverage	4
International coverage	5

Annex B – Most likely hazard log: Phase A - Construction of cofferdam

B.1 Most likely summary hazard list: Phase A - Construction of cofferdam

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1A	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	6	4	4	4
2A	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	6
3A	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	8
4A	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	2	6	6
5A	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	6	6	4
6A	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	4
7A	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	4	2	6	4
8A	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	2	2	2	2

9A	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
10A	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
11A	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	4	6	6
12A	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	4	6	4	6

13A	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	4	6	6	4
14A	Collision with High Speed Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
15A	Collision with Class V Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
16A	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

17A	Collision with commercial freight operator (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
18A	Collision with tug and tow (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

B.2 Most likely hazard list – Phase A: Construction of cofferdam

1A - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1A - LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of temporary cofferdam 	<ul style="list-style-type: none"> Multiple Major Injuries Minor Damage - Barge Minor Damage - Tug Moderate Damage - Passenger Vessel Moderate Damage - High Speed Craft Moderate Damage - Private Leisure Vessel Moderate Damage - Sailing Boat / Small Vessel Minor Pollution 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advice of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2A - LTTKE - Contact - High Speed Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2A - LTTKE	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

3A - LTTKE - Contact - Class V Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3A - LTTKE	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance

- General Directions for Navigation in the Port of London
- Schedule to the General Directions for Navigation in the Port of London
- Permanent Notice to Mariners
- Code of Practice Passenger Vessel Operations on the Thames
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment

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- | | |
|--------------------|--------------------------------|
| Working at height | Loading / Unloading operations |
| Lifting operations | Movement of materials |
| Slips and trips | Mooring |
| Fire safety | Welfare Amenities |

4A - LTTKE - Contact - Private Leisure Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4A - LTTKE	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners • VTS Navigational Broadcast 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
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Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

5A - LTTKE - Contact - Commercial freight with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5A - LTTKE	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment								
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Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

6A - LTTKE - Contact - Tug and Tow with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6A - LTTKE	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

7A - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7A - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Minor Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	<ul style="list-style-type: none"> • No additional safeguards identified for this potential hazard for this site.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
•

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

8A - LTTKE - Mooring breakout

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
8A - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Adverse weather conditions • Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage – Barge • Minor Damage – Vessel (Non Thames Tideway Tunnel) • Minor Damage - Cofferdam (Thames Tideway Tunnel) • Minor Structural Damage - Jetty (Other) • Minor Pollution 	<ul style="list-style-type: none"> • Tug Operator Procedures • Emergency Plans & Procedures • Mooring Inspections • Inspection Routine • Qualified Crew 	<ul style="list-style-type: none"> • Use of reputable marine contractors

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
<ul style="list-style-type: none"> • Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Assessment Notes

9A - LTTKE - Collision with High Speed Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9A - LTTKE	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Minor Damage - High Speed Craft • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

10A - LTTKE- Collision with Class V Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10A - LTTKE	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Passenger Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • BML Local Knowledge Endorsement • Thames AIS • Passage Planning • VHF Communications • Tug Operator Procedures • General Directions • Vessel Master Experience • VTS Navigational Broadcast • COLREGs • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

11A - LTTKE - Collision with Private Leisure Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
11A LTTKE	Collision with Private Leisure Vessel (Construction/Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Private Leisure Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Vessel Master Experience • Qualified Crew • VHF Communications • VTS Navigational Broadcast • Ship Towage Code of Practice • Tug Operator Procedures • COLREGs • General Directions • Admiralty Charts • Perm / Temp Notice to Mariners • Emergency Plans & Procedures • Aids to Navigation 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • River Thames Recreational Users Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

12A - LTTKE - Collision with Commercial Freight Operator (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
12A - LTTKE	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Tug Operator Procedures • Perm / Temp Notice to Mariners • COLREGS • General Directions 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Sub Contractors Risk Assessment												
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare</td> </tr> <tr> <td>Amenities</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Lifting operations</td> <td>Mooring</td> <td></td> </tr> <tr> <td>Slips and trips</td> <td></td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare	Amenities	Movement of materials	Fire safety	Lifting operations	Mooring		Slips and trips		
Working at height	Loading / Unloading operations	Welfare										
Amenities	Movement of materials	Fire safety										
Lifting operations	Mooring											
Slips and trips												

13A - LTTKE - Collision with Tug and Tow (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
13A - LTTKE	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Perm / Temp Notice to Mariners • Tug Operator Procedures • General Directions • COLREGS 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

14A - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
14A - LTTKE	Collision with High Speed Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Minor Damage - High Speed Craft • Minor Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes
Not relevant for this phase of the project

15A - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
15A - LTTKE	Collision with Class V Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Passenger Vessel • Minor Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

16A - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
16A LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Private Leisure Vessel • Minor Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

17A - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
17A - LTTKE	Collision with commercial freight operator (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

18A - LTTKE - Collision with Tug and Tow (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
18A - LTTKE	Collision with tug and tow (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

Annex C– Most likely hazard log: Phase B - Construction of drop shaft/culvert/connection

C.1 Summary most likely hazard list: Phase B - Construction of drop shaft/culvert/connections

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1B	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	9	6	6	6
2B	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	6
3B	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	6
4B	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	9	3	9	9
5B	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	6	6	4
6B	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	4
7B	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	4	2	6	4
8B	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	4	4	4	4

9B	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
10B	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
11B	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
12B	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A

13B	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
14B	Collision with High Speed Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park.	6	4	6	6
15B	Collision with Class V Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	6	4	6	6

16B	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	9	6	9	9
17B	Collision with commercial freight operator (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	4	6	4	6
18B	Collision with tug and tow (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	4	6	4	6

C.2 Most likely hazard list – Phase B: Construction of drop shaft/culvert/connections

1B - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1B - LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of temporary cofferdam 	<ul style="list-style-type: none"> Multiple Major Injuries Minor Damage - Barge Minor Damage - Tug Moderate Damage - Passenger Vessel Moderate Damage - High Speed Craft Moderate Damage - Private Leisure Vessel Moderate Damage - Sailing Boat / Small Vessel Minor Pollution 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advice of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2B - LTTKE - Contact - High Speed Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2B - LTTKE	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Code of Practice Passenger Vessel Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

3B - LTTKE - Contact - Class V Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3B - LTTKE	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

4B - LTTKE - Contact - Private Leisure Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4B - LTTKE	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners • VTS Navigational Broadcast 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	4	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	4	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

5B - LTTKE - Contact - Commercial freight with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5B - LTTKE	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

6B - LTTKE - Contact - Tug and Tow with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6B - LTTKE	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

7B - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7B - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Minor Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	<ul style="list-style-type: none"> • No additional safeguards identified for this potential hazard for this site.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

8B - LTTKE - Mooring breakout

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
8B - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> Single Major Injury Minor Damage – Barge Minor Damage – Vessel (Non Thames Tideway Tunnel) Minor Damage - Cofferdam (Thames Tideway Tunnel) Minor Structural Damage - Jetty (Other) Minor Pollution 	<ul style="list-style-type: none"> Tug Operator Procedures Emergency Plans & Procedures Mooring Inspections Inspection Routine Qualified Crew 	<ul style="list-style-type: none"> Use of reputable marine contractors

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

9B - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9B - LTTKE	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Minor Damage - High Speed Craft • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

10B - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
10B - LTTKE	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Passenger Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

11B - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
11B LTTKE	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Private Leisure Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

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Post Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes

Not relevant for this phase of the project
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12B - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
12B - LTTKE	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

13B - LTTKE - Collision with Tug and Tow (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
13B - LTTKE	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

14B - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
14B - LTTKE	Collision with High Speed Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - High Speed Craft • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

15B - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
15B- LTTKE	Collision with Class V Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Passenger Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners •Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

16B - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
16B LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Private Leisure Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Vessel Master Experience • Qualified Crew • VHF Communications • VTS Navigational Broadcast • Ship Towing Code of Practice • Tug Operator Procedures • COLREGs • General Directions • Admiralty Charts • Perm / Temp Notice to Mariners • Emergency Plans & Procedures • Aids to Navigation 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Assessment Notes

17B - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
17B - LTTKE	Collision with commercial freight operator (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance

- General Directions for Navigation in the Port of London
- Schedule to the General Directions for Navigation in the Port of London
- Pilotage Directions
- River Byelaws 1978 (as amended)
- Permanent Notice to Mariners
- Ship Towing Operations on the Thames
- Code of Practice for Craft Towing Operations on the Thames
- Port Entry Guide
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

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18B - LTTKE - Collision with Tug and Tow (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
18B - LTTKE	Collision with tug and tow (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

Annex D– Most likely hazard log: Phase C – Removal of of cofferdam

D.1 Most likely summary hazard list: Phase C - Removal of cofferdam

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1C	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	6	4	4	4
2C	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	6
3C	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	8
4C	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	2	6	6
5C	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	6	6	4
6C	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	4	6	4
7C	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	4	2	6	4

8C	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	2	2	2	2
9C	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
10C	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
11C	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	4	6	6

12C	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	4	6	4	6
13C	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	4	6	6	4
14C	Collision with High Speed Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
15C	Collision with Class V Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

16C	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
17C	Collision with commercial freight operator (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
18C	Collision with tug and tow (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

D.2 Most likely hazard list – Phase C: Removal of cofferdam

1C - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1C- LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of temporary cofferdam 	<ul style="list-style-type: none"> Multiple Major Injuries Minor Damage - Barge Minor Damage - Tug Moderate Damage - Passenger Vessel Moderate Damage - High Speed Craft Moderate Damage - Private Leisure Vessel Moderate Damage - Sailing Boat / Small Vessel Minor Pollution 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advise of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2C - LTTKE - Contact - High Speed Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2C - LTTKE	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Code of Practice Passenger Vessel Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

3C - LTTKE - Contact - Class V Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3C - LTTKE	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Code of Practice Passenger Vessel Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

4C - LTTKE - Contact - Private Leisure Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4C - LTTKE	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners • VTS Navigational Broadcast 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

5C - LTTKE - Contact - Commercial freight with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5C - LTTKE	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance

- General Directions for Navigation in the Port of London
- Schedule to the General Directions for Navigation in the Port of London
- Pilotage Directions
- River Byelaws 1978 (as amended)
- Permanent Notice to Mariners
- Ship Towage Operations on the Thames
- Code of Practice for Craft Towage Operations on the Thames
- Port Entry Guide
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment

An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:

- | | |
|--------------------|--------------------------------|
| Working at height | Loading / Unloading operations |
| Lifting operations | Movement of materials |
| Slips and trips | Mooring |
| Fire safety | Welfare Amenities |

6A - LTTKE - Contact - Tug and Tow with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6C - LTTKE	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance

- General Directions for Navigation in the Port of London
- Schedule to the General Directions for Navigation in the Port of London
- Pilotage Directions
- River Byelaws 1978 (as amended)
- Permanent Notice to Mariners
- Ship Towage Operations on the Thames
- Code of Practice for Craft Towage Operations on the Thames
- Port Entry Guide
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment

An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:

- | | |
|--------------------|--------------------------------|
| Working at height | Loading / Unloading operations |
| Lifting operations | Movement of materials |
| Slips and trips | Mooring |
| Fire safety | Welfare Amenities |

7C - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7C - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Minor Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	<ul style="list-style-type: none"> • No additional safeguards identified for this potential hazard for this site.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

8C - LTTKE - Mooring breakout

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Likely Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
8C - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Adverse weather conditions • Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage – Barge • Minor Damage – Vessel (Non Thames Tideway Tunnel) • Minor Damage - Cofferdam (Thames Tideway Tunnel) • Minor Structural Damage - Jetty (Other) • Minor Pollution 	<ul style="list-style-type: none"> • Tug Operator Procedures • Emergency Plans & Procedures • Mooring Inspections • Inspection Routine • Qualified Crew 	<ul style="list-style-type: none"> • Use of reputable marine contractors

Pre Control - People

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance

- Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People

Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Assessment Notes

9C - LTTKE - Collision with High Speed Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9C - LTTKE	Collision with High Speed Passenger Vessel (Construction/Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Minor Damage - High Speed Craft • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners •Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

10C - LTTKE- Collision with Class V Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10C - LTTKE	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Passenger Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • BML Local Knowledge Endorsement • Thames AIS • Passage Planning • VHF Communications • Tug Operator Procedures • General Directions • Vessel Master Experience • VTS Navigational Broadcast • COLREGs • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

11C - LTTKE - Collision with Private Leisure Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
11C - LTTKE	Collision with Private Leisure Vessel (Construction/Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Private Leisure Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Vessel Master Experience • Qualified Crew • VHF Communications • VTS Navigational Broadcast • Ship Towing Code of Practice • Tug Operator Procedures • COLREGs • General Directions • Admiralty Charts • Perm / Temp Notice to Mariners • Emergency Plans & Procedures • Aids to Navigation 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • River Thames Recreational Users Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

12C - LTTKE - Collision with Commercial Freight Operator (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
12C - LTTKE	Collision with commercial freight operator (Construction/Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Tug Operator Procedures • Perm / Temp Notice to Mariners • COLREGS • General Directions 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment												
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Working at height</td> <td style="width: 33%;">Loading / Unloading operations</td> <td style="width: 33%;">Welfare</td> </tr> <tr> <td>Amenities</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Lifting operations</td> <td>Mooring</td> <td></td> </tr> <tr> <td>Slips and trips</td> <td></td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare	Amenities	Movement of materials	Fire safety	Lifting operations	Mooring		Slips and trips		
Working at height	Loading / Unloading operations	Welfare										
Amenities	Movement of materials	Fire safety										
Lifting operations	Mooring											
Slips and trips												

13C - LTTKE - Collision with Tug and Tow (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
13C - LTTKE	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> Reduced effective river width Misjudgement Inattention Non Compliance with procedures Improper lookout Lack of communications Machinery breakdown Collision avoidance High density of leisure traffic Leisure traffic impedes the passage of vessel navigating the channel Change in river flow due to new in-river structure Tidal set 	<ul style="list-style-type: none"> Single Major Injury Minor Damage - Barge Moderate Damage - Tug Minor Pollution 	<ul style="list-style-type: none"> Boat Masters Licence Qualified Crew Bridge Special Signal Lights Emergency Plans & Procedures VTS Navigational Broadcast Thames AIS Passage Planning Ship Towing Code of Practice BML Local Knowledge Endorsement Perm / Temp Notice to Mariners Tug Operator Procedures General Directions COLREGS 	<ul style="list-style-type: none"> Light Warnings - providing visual warning that barge is about to depart berth Sound Warnings - providing audio warning that barge is about to depart berth Sub-Contractors Risk Assessment Use of reputable and experienced marine contractor Berth Co-ordinator Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions River Byelaws 1978 (as amended) Permanent Notice to Mariners Ship Towing Operations on the Thames Code of Practice for Craft Towing Operations on the Thames Port Entry Guide Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

14C - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
14C - LTTKE	Collision with High Speed Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Minor Damage - High Speed Craft • Minor Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

15C - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
15C - LTTKE	Collision with Class V Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Passenger Vessel • Minor Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

16A - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
16C - LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Major Injuries • Minor Damage - Barge • Moderate Damage - Private Leisure Vessel • Minor Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

17C - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
17C - LTTKE	Collision with commercial freight operator (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

18C - LTTKE - Collision with Tug and Tow (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
18C - LTTKE	Collision with tug and tow (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Moderate Damage - Tug • Bridge Arch Closure - Temporary • Minor Pollution 	<ul style="list-style-type: none"> • Not relevant for this phase of the project 	<ul style="list-style-type: none"> • Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

Annex E– Most likely hazard log: Phase D – Permanent work site

E.1 Most likely summary hazard list: Phase D –Permanent work site

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1D	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	9	6	6	9
2D	Contact - High Speed passenger vessel with permanent structure	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	6	4	6	6
3D	Contact - Class V passenger vessel with permanent structure	A Class V passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	6	4	6	6
4D	Contact - Private leisure vessel with permanent structure	Private leisure vessels, including narrow boats, comes into contact with Thames Tunnel permanent structure at King Edward Memorial Park.	9	6	9	9
5D	Contact - commercial freight with permanent structure	Commercial freight comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	6	6	6	6
6D	Contact - Tug and Tow with permanent structure	A Tug and Tow comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	6	4	6	6
7D	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	6	2	6	6

8D	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.	N/A	N/A	N/A	N/A
9D	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
10D	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
11D	Collision with Private Leisure Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
12D	Collision with commercial freight operator	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
13D	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A

14D	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
15D	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
16D	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A

17D	Collision with commercial freight operator	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
18D	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A

E.2 Most likely hazard list – Phase D: Permanent work site

1D - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1D - LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of permanent structure 	<ul style="list-style-type: none"> Multiple Major Injuries Minor Damage - Barge Minor Damage - Tug Moderate Damage - Passenger Vessel Moderate Damage - High Speed Craft Moderate Damage - Private Leisure Vessel Moderate Damage - Sailing Boat / Small Vessel Minor Pollution 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advice of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2D - LTTKE - Contact - High Speed Passenger Vessel with Permanent Structure

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
2D - LTTKE	Contact - High Speed passenger vessel with permanent structure	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Passenger Vessel • Moderate Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

<i>Relevant PLA Guidance</i>
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

<i>Assessment Notes</i>

3D - LTTKE - Contact - Class V Passenger Vessel with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3D - LTTKE	Contact - Class V passenger vessel with permanent structure	A Class V passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	<ul style="list-style-type: none"> Reduced effective river width Misjudgement Inattention Adverse weather conditions Machinery breakdown High density of leisure traffic Collision avoidance Leisure traffic impedes the passage of vessel navigating the channel Tidal set Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> Multiple Major Injuries Moderate Damage - Passenger Vessel Moderate Damage - High Speed Craft Minor Pollution 	<ul style="list-style-type: none"> Boat Masters Licence BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Permanent / Temporary Notice to Mariners Aids to Navigation VTS Navigational Broadcast Passage Planning COLREGs VHF Communications Emergency Plans & Procedures 	<ul style="list-style-type: none"> Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Permanent Notice to Mariners Code of Practice Passenger Vessel Operations on the Thames Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

4D - LTTKE - Contact - Private Leisure Vessel with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4D - LTTKE	Contact - Private leisure vessel with permanent structure	Private leisure vessels, including narrow boats, comes into contact with Thames Tunnel permanent structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Multiple Major Injuries • Moderate Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners 	<ul style="list-style-type: none"> • Update PLA Chart • Provide information to local recreational clubs and marinas

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	4	16	Extreme

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Mariners Guide to Bridges on the Tidal Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Assessment Notes

5D - LTTKE - Contact - Commercial freight with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5D - LTTKE	Contact - commercial freight with permanent structure	Commercial freight comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

6D - LTTKE - Contact - Tug and Tow with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6D - LTTKE	Contact - Tug and Tow with permanent structure	A Tug and Tow comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Moderate Damage - Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

7D - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7D - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single Major Injury • Minor Damage - Barge • Minor Damage - Tug • Bridge Arch Closure - Temporary • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes

8D - LTTKE - Mooring breakout

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Likely Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
8D - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

9D - LTTKE - Collision with High Speed Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
9D - LTTKE	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Assessment Notes</i>
Not relevant for this phase of the project

10D - LTTKE- Collision with Class V Passenger Vessel

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10D - LTTKE	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

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Post Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes

Not relevant for this phase of the project
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11D - LTTKE - Collision with Private Leisure Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
11D - LTTKE	Collision with Private Leisure Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

12D - LTTKE - Collision with Commercial Freight Operator

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
12D - LTTBF	Collision with commercial freight operator	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

13D - LTTKE - Collision with Tug and Tow

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
13D - LTTKE	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

14D - LTTKE - Collision with High Speed Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
14D - LTTKE	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Assessment Notes</i>
Not relevant for this phase of the project

15D - LTTKE- Collision with Class V Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
15D - LTTKE	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes
Not relevant for this phase of the project

16D - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
16D - LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

17D - LTTKE - Collision with Commercial Freight Operator

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
17D - LTTKE	Collision with commercial freight operator	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

18D - LTTKE - Collision with Tug and Tow

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
18D - LTTKE	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes
Not relevant for this phase of the project

Annex F– Worst credible hazard log: Phase A - Construction of cofferdam

F.1 Worst credible summary hazard list: Phase A - Construction of cofferdam

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1E	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	8	4	6	6
2E	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	8	8
3E	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	8	8
4E	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	2	8	8
5E	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	6	6	8
6E	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	8	6	8
7E	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	4	2	6	4
8E	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	3	3	3	3

9E	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
10E	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
11E	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	8	4	6	8
12E	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	6	6	6

13E	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	6	6	6
14E	Collision with High Speed Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
15E	Collision with Class V Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
16E	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

17E	Collision with commercial freight operator (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
18E	Collision with tug and tow (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

F.2 Most credible hazard list – Phase A: Construction of cofferdam

1E - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1E - LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of temporary cofferdam 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Moderate Damage - Barge Moderate Damage - Tug Major Damage - Passenger Vessel Major Damage - High Speed Craft Major Damage - Private Leisure Vessel Major Damage - Sailing Boat / Small Vessel Short to Medium term environmental impact 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advice of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2E - LTTKE - Contact - High Speed Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2E - LTTKE	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Code of Practice Passenger Vessel Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

3E - LTTKE - Contact - Class V Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3E - LTTKE	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Passenger Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People

Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance

- General Directions for Navigation in the Port of London
- Schedule to the General Directions for Navigation in the Port of London
- Permanent Notice to Mariners
- Code of Practice Passenger Vessel Operations on the Thames
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People

Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment

An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:

- | | |
|--------------------|--------------------------------|
| Working at height | Loading / Unloading operations |
| Lifting operations | Movement of materials |
| Slips and trips | Mooring |
| Fire safety | Welfare Amenities |

4E - LTTKE - Contact - Private Leisure Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4E - LTTKE	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners • VTS Navigational Broadcast 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

5E - LTTKE - Contact - Commercial freight with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5E - LTTKE	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

6E - LTTKE - Contact - Tug and Tow with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6E - LTTKE	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

7E - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7E - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage - Barge • Moderate Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	<ul style="list-style-type: none"> • No additional safeguards identified for this potential hazard for this site.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

8E - LTTKE - Mooring breakout

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
8E - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> Lost time injury / Moderate permanent partial disability injury Moderate Damage – Barge Moderate Damage – Vessel (Non Thames Tideway Tunnel) Moderate Damage - Cofferdam (Thames Tideway Tunnel) Moderate Structural Damage - Jetty (Other) Short to Medium term environmental impact 	<ul style="list-style-type: none"> Tug Operator Procedures Emergency Plans & Procedures Mooring Inspections Inspection Routine Qualified Crew 	<ul style="list-style-type: none"> Use of reputable marine contractors

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Assessment Notes

9E - LTTKE - Collision with High Speed Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9E - LTTKE	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Moderate Damage - Barge • Moderate Damage - High Speed Craft • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

10E - LTTKE- Collision with Class V Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10E - LTTKE	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Moderate Damage - Barge • Moderate Damage – Passenger Vessel • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • BML Local Knowledge Endorsement • Thames AIS • Passage Planning • VHF Communications • Tug Operator Procedures • General Directions • Vessel Master Experience • VTS Navigational Broadcast • COLREGs • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
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Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

11E - LTTKE - Collision with Private Leisure Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
11E - LTTKE	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Moderate Damage – Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Vessel Master Experience • Qualified Crew • VHF Communications • VTS Navigational Broadcast • Ship Towage Code of Practice • Tug Operator Procedures • COLREGs • General Directions • Admiralty Charts • Perm / Temp Notice to Mariners • Emergency Plans & Procedures • Aids to Navigation 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • River Thames Recreational Users Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide

Sub Contractors Risk Assessment								
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Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

12E - LTTKE - Collision with Commercial Freight Operator (construction/deconstruction)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
12E - LTTKE	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage – Barge • Moderate Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Tug Operator Procedures • Perm / Temp Notice to Mariners • COLREGS • General Directions 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
9	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment												
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Working at height	Loading / Unloading operations	Welfare										
Amenities	Movement of materials	Fire safety										
Lifting operations	Mooring											
Slips and trips												

13E - LTTKE - Collision with Tug and Tow (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
13E - LTTKE	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage – Barge • Moderate Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Perm / Temp Notice to Mariners • Tug Operator Procedures • General Directions • COLREGS 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

14E - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
14E - LTTKE	Collision with High Speed Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

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Post Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes

Not relevant for this phase of the project
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15E - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
15E - LTTKE	Collision with Class V Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

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Post Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes

Not relevant for this phase of the project
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16E - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
16E - LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

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Post Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes

Not relevant for this phase of the project
--

17E - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
17E - LTTKE	Collision with commercial freight operator (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	• Not relevant for this phase of the project	• Not relevant for this phase of the project

Pre Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

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Post Control - People

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Assessment Notes

Not relevant for this phase of the project
--

18E - LTTKE - Collision with Tug and Tow (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
18E - LTTKE	Collision with tug and tow (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

Annex G– Worst credible hazard log: Phase B - Construction of drop shaft/culvert/connection

G.1 Summary worst credible hazard list: Phase B - Construction of drop shaft/culvert/connections

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1F	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	12	6	9	9
2F	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	6	8
3F	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	6	8
4F	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	2	6	8
5F	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	6	8	8	8
6F	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	8	8
7F	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	4	2	6	4
8F	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	6	4	6	6

9F	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
10F	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
11F	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
12F	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A

13F	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	N/A	N/A	N/A	N/A
14F	Collision with High Speed Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park.	8	4	8	8
15F	Collision with Class V Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	8	4	8	8

16F	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	10	6	8	8
17F	Collision with commercial freight operator (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	6	6	8	8
18F	Collision with tug and tow (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	6	6	8	8

G.2 Worst credible hazard list – Phase B: Construction of drop shaft/culvert/connections

1F - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1F - LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of temporary cofferdam 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Moderate Damage - Barge Moderate Damage - Tug Major Damage - Passenger Vessel Major Damage - High Speed Craft Major Damage - Private Leisure Vessel Major Damage - Sailing Boat / Small Vessel Short to Medium term environmental impact 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advise of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	4	16	Extreme

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2F - LTTKE - Contact - High Speed Passenger Vessel with Work Site

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
2F - LTTKE	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Permanent Notice to Mariners • Code of Practice Passenger Vessel Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

3F - LTTKE - Contact - Class V Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3F - LTTKE	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Passenger Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

4F - LTTKE - Contact - Private Leisure Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4F - LTTKE	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners • VTS Navigational Broadcast 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

5F - LTTKE - Contact - Commercial freight with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5F - LTTKE	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towing Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towing Operations on the Thames •Code of Practice for Craft Towing Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

6F - LTTKE - Contact - Tug and Tow with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6F - LTTKE	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

7F - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7F - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage - Barge • Moderate Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	<ul style="list-style-type: none"> • No additional safeguards identified for this potential hazard for this site.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

8F - LTTKE - Mooring breakout

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
8F - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> Lost time injury / Moderate permanent partial disability injury Moderate Damage – Barge Moderate Damage – Vessel (Non Thames Tideway Tunnel) Moderate Damage - Cofferdam (Thames Tideway Tunnel) Moderate Structural Damage - Jetty (Other) Short to Medium term environmental impact 	<ul style="list-style-type: none"> Tug Operator Procedures Emergency Plans & Procedures Mooring Inspections Inspection Routine Qualified Crew 	<ul style="list-style-type: none"> Use of reputable marine contractors

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Assessment Notes

9F - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
9F - LTTKE	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

10F - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
10F - LTTKE	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

11F - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
11F - LTTKE	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

12F - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
12F - LTTKE	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

13F - LTTKE - Collision with Tug and Tow (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
13F - LTTKE	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

14F - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
14F - LTTKE	Collision with High Speed Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - High Speed Craft • Major Damage – Tug • Major Damage - Barge • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners •Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

15F - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
15F- LTTKE	Collision with Class V Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Passenger Vessel • Major Damage – Tug • Major Damage - Barge • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners •Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

16F - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
16F - LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Multiple Fatalities • Moderate Damage - Barge • Major Damage - Private Leisure Vessel • Minor Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Vessel Master Experience • Qualified Crew • VHF Communications • VTS Navigational Broadcast • Ship Towing Code of Practice • Tug Operator Procedures • COLREGs • General Directions • Admiralty Charts • Perm / Temp Notice to Mariners • Emergency Plans & Procedures • Aids to Navigation 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
5	3	15	Extreme

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
5	2	10	High

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

17F - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
17F - LTTKE	Collision with commercial freight operator (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

18F - LTTKE - Collision with Tug and Tow (delivery/material removal)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
18F - LTTKE	Collision with tug and tow (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Use of reputable and experienced marine contractor • Berth Master • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Master to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes

Annex H– Worst credible hazard log: Phase C – Removal of of cofferdam

H.1 Worst credible summary hazard list: Phase C - Removal of cofferdam

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1G	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	8	4	8	6
2G	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	8	8
3G	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	4	8	8
4G	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	2	8	8
5G	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	6	8	8
6G	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	8	6	8	8
7G	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	4	2	6	4
8G	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	3	3	3	3

9G	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
10G	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	4	6	8
11G	Collision with Private Leisure Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	8	4	6	8
12G	Collision with commercial freight operator (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	6	6	6

13G	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	6	6	6	6
14G	Collision with High Speed Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
15G	Collision with Class V Passenger Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
16G	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

17G	Collision with commercial freight operator (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A
18G	Collision with tug and tow (delivery/ material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	N/A	N/A	N/A	N/A

H.2 Worst credible hazard list – Phase C: Removal of cofferdam

1G - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1G- LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of temporary cofferdam 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Moderate Damage - Barge Moderate Damage - Tug Major Damage - Passenger Vessel Major Damage - High Speed Craft Major Damage - Private Leisure Vessel Major Damage - Sailing Boat / Small Vessel Short to Medium term environmental impact 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advice of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2G - LTTKE - Contact - High Speed Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2G - LTTKE	Contact - High Speed passenger vessel with work site	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

3G - LTTKE - Contact - Class V Passenger Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3G - LTTKE	Contact - Class V passenger vessel with work site	A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Passenger Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

4G - LTTKE - Contact - Private Leisure Vessel with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4G - LTTKE	Contact - Private leisure vessel with work site	Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners • VTS Navigational Broadcast 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

5G - LTTKE - Contact - Commercial freight with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5G - LTTKE	Contact - commercial freight with work site	Commercial freight comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

6G - LTTKE - Contact - Tug and Tow with Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6G - LTTKE	Contact - Tug and Tow with work site	A Tug and Tow comes into contact with Thames Tideway Tunnel work site at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment								
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table>	Working at height	Loading / Unloading operations	Lifting operations	Movement of materials	Slips and trips	Mooring	Fire safety	Welfare Amenities
Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

7G - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7G - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage - Barge • Moderate Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	<ul style="list-style-type: none"> • No additional safeguards identified for this potential hazard for this site.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Assessment Notes

8G - LTTKE - Mooring breakout

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Likely Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
8G - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Adverse weather conditions • Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage – Barge • Moderate Damage – Vessel (Non Thames Tideway Tunnel) • Moderate Damage - Cofferdam (Thames Tideway Tunnel) • Moderate Structural Damage - Jetty (Other) • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Tug Operator Procedures • Emergency Plans & Procedures • Mooring Inspections • Inspection Routine • Qualified Crew 	<ul style="list-style-type: none"> • Use of reputable marine contractors

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Assessment Notes

9G - LTTKE - Collision with High Speed Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9G - LTTKE	Collision with High Speed Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Tug or line failure • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Moderate Damage - Barge • Moderate Damage - High Speed Craft • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

10G - LTTKE- Collision with Class V Passenger Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10G - LTTKE	Collision with Class V Passenger Vessel (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Inadequate training and experience • Tidal set • Collision avoidance • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Moderate Damage - Barge • Moderate Damage – Passenger Vessel • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • BML Local Knowledge Endorsement • Thames AIS • Passage Planning • VHF Communications • Tug Operator Procedures • General Directions • Vessel Master Experience • VTS Navigational Broadcast • COLREGs • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide • Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Sub Contractors Risk Assessment									
<p>An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table>	Working at height	Loading / Unloading operations	Welfare Amenities	Lifting operations	Movement of materials	Fire safety	Slips and trips	Mooring	
Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

11G - LTTKE - Collision with Private Leisure Vessel (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
11G - LTTKE	Collision with Private Leisure Vessel (Construction/Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of King Edwards Memorial Park, during the construction/deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • High density of leisure traffic • Machinery breakdown • Change in river flow due to new in-river structure • General lack of marine knowledge 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Moderate Damage – Barge • Moderate Damage - Tug • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Vessel Master Experience • Qualified Crew • VHF Communications • VTS Navigational Broadcast • Ship Towage Code of Practice • Tug Operator Procedures • COLREGs • General Directions • Admiralty Charts • Perm / Temp Notice to Mariners • Emergency Plans & Procedures • Aids to Navigation 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • River Thames Recreational Users Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners • Port Entry Guide

Sub Contractors Risk Assessment								
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Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

12G - LTTKE - Collision with Commercial Freight Operator (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
12G - LTTKE	Collision with commercial freight operator (Construction/Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the construction/deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage – Barge • Moderate Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Tug Operator Procedures • Perm / Temp Notice to Mariners • COLREGS • General Directions 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
9	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Sub Contractors Risk Assessment									
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Working at height	Loading / Unloading operations	Welfare Amenities							
Lifting operations	Movement of materials	Fire safety							
Slips and trips	Mooring								

13G - LTTKE - Collision with Tug and Tow (construction/deconstruction)

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
13G - LTTKE	Collision with tug and tow (Construction/ Deconstruction)	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the construction/ deconstruction of the temporary cofferdam.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Non Compliance with procedures • Improper lookout • Lack of communications • Machinery breakdown • Collision avoidance • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Change in river flow due to new in-river structure • Tidal set 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage – Barge • Moderate Damage - Tug • Short to Medium term environmental impact 	<ul style="list-style-type: none"> • Boat Masters Licence • Qualified Crew • Bridge Special Signal Lights • Emergency Plans & Procedures • VTS Navigational Broadcast • Thames AIS • Passage Planning • Ship Towage Code of Practice • BML Local Knowledge Endorsement • Perm / Temp Notice to Mariners • Tug Operator Procedures • General Directions • COLREGS 	<ul style="list-style-type: none"> • Light Warnings - providing visual warning that barge is about to depart berth • Sound Warnings - providing audio warning that barge is about to depart berth • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Berth Co-ordinator • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Sub Contractors Risk Assessment								
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Working at height	Loading / Unloading operations							
Lifting operations	Movement of materials							
Slips and trips	Mooring							
Fire safety	Welfare Amenities							

14G - LTTKE - Collision with High Speed Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
14G - LTTKE	Collision with High Speed Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edwards Memorial Park during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

15G - LTTKE- Collision with Class V Passenger Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
15G - LTTKE	Collision with Class V Passenger Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

16G - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
16G - LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project	Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

17G - LTTKE - Collision with Commercial Freight Operator (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
17G - LTTKE	Collision with commercial freight operator (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park, during the delivery/material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	• Not relevant for this phase of the project	• Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

18G - LTTKE - Collision with Tug and Tow (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
18G - LTTKE	Collision with tug and tow (delivery/material removal)	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park, during the delivery/ material removal of the temporary cofferdam.	Not relevant for this phase of the project	Not relevant for this phase of the project	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

Annex I – Worst credible hazard log: Phase D – Permanent work site

I.1 Worst credible summary hazard list: Phase D – Permanent work site

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1H	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	8	4	8	6
2H	Contact - High Speed passenger vessel with permanent structure	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	8	4	8	8
3H	Contact - Class V passenger vessel with permanent structure	A Class V passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	8	4	8	8
4H	Contact - Private leisure vessel with permanent structure	Private leisure vessels, including narrow boats, comes into contact with Thames Tunnel permanent structure at King Edward Memorial Park.	8	4	8	8
5H	Contact - commercial freight with permanent structure	Commercial freight comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	8	6	8	8
6H	Contact - Tug and Tow with permanent structure	A Tug and Tow comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	8	6	8	8
7H	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	6	2	6	6

8H	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.	N/A	N/A	N/A	N/A
9H	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
10H	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
11H	Collision with Private Leisure Vessel	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
12H	Collision with commercial freight operator	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
13H	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A

14H	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
15H	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
16H	Collision with Private Leisure Vessel (delivery/ material removal)	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
17H	Collision with commercial freight operator	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A

18H	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	N/A	N/A	N/A	N/A
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I.2 Worst credible hazard list – Phase D: Permanent work site

1H - LTTKE - Increased Flow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1H - LTTKE	Increase in Flow	Changes to the hydrodynamics of the river may affect passing vessels.	<ul style="list-style-type: none"> Shape and position of permanent structure 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Moderate Damage - Barge Moderate Damage - Tug Major Damage - Passenger Vessel Major Damage - High Speed Craft Major Damage - Private Leisure Vessel Major Damage - Sailing Boat / Small Vessel Moderate Pollution 	<ul style="list-style-type: none"> None identified for this hazard 	<ul style="list-style-type: none"> 3D and computational modelling A Notice to Mariners to advice of any increases in river flow. The design of the works site (both Temporary and Permanent) take into consideration the possible changes in river flow and have been adjusted, where possible, to minimise the change.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions Port Entry Guide

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> Fluvial modelling (numerical and physical) has been used to develop the design of the structure. Analysis of HR Wallingford fluvial modelling report indicates minimum change in flow in this area.

2H - LTTKE - Contact - High Speed Passenger Vessel with Permanent Structure

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2H - LTTKE	Contact - High Speed passenger vessel with permanent structure	A High Speed passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Passenger Vessel • Major Damage - High Speed Craft • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • HSC Code • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

3H - LTTKE - Contact - Class V Passenger Vessel with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3H - LTTKE	Contact - Class V passenger vessel with permanent structure	A Class V passenger vessel comes into contact with Thames Tideway Tunnel permanent work structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Leisure traffic impedes the passage of vessel navigating the channel • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Passenger Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • VTS Navigational Broadcast • Passage Planning • COLREGs • VHF Communications • Emergency Plans & Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Code of Practice Passenger Vessel Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

4H - LTTKE - Contact - Private Leisure Vessel with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4H - LTTKE	Contact - Private leisure vessel with permanent structure	Private leisure vessels, including narrow boats, comes into contact with Thames Tunnel permanent structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Private Leisure Vessel • Capsized Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Aids to Navigation • VHF Communications • COLREGs • General Directions • Permanent / Temporary Notice to Mariners 	<ul style="list-style-type: none"> • Update PLA Chart • Provide information to local recreational clubs and marinas

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Permanent Notice to Mariners •Mariners Guide to Bridges on the Tidal Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes

5H - LTTKE - Contact - Commercial freight with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5H - LTTKE	Contact - commercial freight with permanent structure	Commercial freight comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Moderate Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towing Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towing Operations on the Thames •Code of Practice for Craft Towing Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes

6H - LTTKE - Contact - Tug and Tow with Permanent Work Site

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6H - LTTKE	Contact - Tug and Tow with permanent structure	A Tug and Tow comes into contact with Thames Tideway Tunnel permanent structure at King Edward Memorial Park.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Machinery breakdown • High density of leisure traffic • Leisure traffic impedes the passage of vessel navigating the channel • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Major Damage - Barge • Major Damage - Tug • Moderate Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • Aids to Navigation • Passage Planning • Ship Towage Code of Practice • COLREGs • Oil Spill Contingency Plan • Tug Operator Procedures 	<ul style="list-style-type: none"> • Update PLA Chart

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes

7H - LTTKE - Vessels subject to increased interaction during periods of low water

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Safeguards
7H - LTTKE	Grounding - All vessels due to 'Squat Effect'	At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.	<ul style="list-style-type: none"> • Reduced effective river width • Misjudgement • Inattention • Lack of communications • Adverse weather conditions • Collision avoidance • Tidal set • Change in river flow due to new in-river structure 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Moderate Damage - Barge • Moderate Damage - Tug • Moderate Damage - Passenger Vessel • Moderate Damage - Private Leisure Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Permanent / Temporary Notice to Mariners • MCA Guidance document 	

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance

Assessment Notes

8H - LTTKE - Mooring breakout

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Likely Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
8H - LTTKE	Mooring breakout	A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

9H - LTTKE - Collision with High Speed Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
9H - LTTKE	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

10H - LTTKE- Collision with Class V Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
10H - LTTKE	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

11H - LTTKE - Collision with Private Leisure Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
11H - LTTKE	Collision with Private Leisure Vessel	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

12H - LTTKE - Collision with Commercial Freight Operator

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
12H - LTTBF	Collision with commercial freight operator	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

13H - LTTKE - Collision with Tug and Tow

Hazard ID	Hazard Title	Hazard Description	Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
13H - LTTKE	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Relevant PLA Guidance

Assessment Notes
Not relevant for this phase of the project

14H - LTTKE - Collision with High Speed Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
14H - LTTKE	Collision with High Speed Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Assessment Notes</i>
Not relevant for this phase of the project

15H - LTTKE- Collision with Class V Passenger Vessel

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
15H - LTTKE	Collision with Class V Passenger Vessel	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

16H - LTTKE - Collision with Private Leisure Vessel (delivery/material removal)

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
16H - LTTKE	Collision with Private Leisure Vessel (delivery/material removal)	A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

17H - LTTKE - Collision with Commercial Freight Operator

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
17H - LTTKE	Collision with commercial freight operator	A vessel conducting Thames Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

18H - LTTKE - Collision with Tug and Tow

<i>Hazard ID</i>	<i>Hazard Title</i>	<i>Hazard Description</i>	<i>Hazard Causes</i>	<i>Consequence(s) Most Likely</i>	<i>Existing Safeguards</i>	<i>Proposed Additional Mitigation</i>
18H - LTTKE	Collision with tug and tow	A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of King Edward Memorial Park.	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project 	<ul style="list-style-type: none"> Not relevant for this phase of the project

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - People			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
Not Assessed	Not Assessed	Not Assessed	Not Assessed

<i>Relevant PLA Guidance</i>

<i>Assessment Notes</i>
Not relevant for this phase of the project

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