



SURFACE TRANSPORT

CONTRACT

FOR

Rotherhithe to Canary Wharf River Crossing – Marine Engineering Support

VOLUME 1 CONTRACT DOCUMENTATION

Project Reference Number: tfl_scp_001762

Transport for London
Palestra House
197 Blackfriars Road
London SE1 8NJ

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FORM OF AGREEMENT

THIS CONTRACT AGREEMENT is made the 11 day of JUNE 2018

BETWEEN

1. **TRANSPORT FOR LONDON** whose registered office is at **55 Broadway, London, SW1H 0BD** (hereinafter called "*the Employer*") which expression shall include its successors in title and permitted assignees; and
2. **MARINE AND RISK CONSULTANTS LTD**, a company incorporated in and in accordance with the laws of **ENGLAND AND WALES** having as its registered number **3767859** and its registered office at **MARICO HOUSE, BRAMSHAW, LYNDHURST, HAMPSHIRE, SO43 7JB** (hereinafter called "*the Consultant*").

RECITALS

- (A) The *Employer* wishes to appoint the *Consultant* to provide Marine Engineering Support Services for the Rotherhithe to Canary Wharf Crossing scheme ("*the services*") for which the *Employer* has submitted to the *Consultant* his invitation to tender.
- (B) The *Consultant* has submitted his tender offer dated **19 MARCH 2018 AND SUBSEQUENT FINANCIAL SUBMISSION RE-SUBMITTED ON 13 APRIL 2018** in response to the *Employer's* invitation to tender. The *Employer* has examined the *Consultant's* said tender and subject to the provisions of this contract is willing to engage the *Consultant* to carry out the *services* in accordance with this contract.

OPERATIVE PROVISIONS

1. In this Contract Agreement, unless the context otherwise requires, words and expressions shall have the same meaning as set out in the *conditions of contract*.
2. The *conditions of contract* are the NEC Professional Services Contract (April 2013) together with and as amended by the amendments set out in Schedule 1, Amendments to NEC3 Professional Services Contract.
3. This contract shall mean this document and the following documents in order of priority which are hereby incorporated into and shall comprise this contract:
 - 3.1 this Contract Agreement duly executed by the Parties;



- 3.2 the *conditions of contract*;
 - 3.3 the Contract Data Part 1;
 - 3.4 the Contract Data Part 2;
 - 3.5 the Volume 2 – The Scope; and
 - 3.6 the *Consultant's* Quality submission.
4. The *Consultant* provides the *services* in accordance with this contract.
5. The *Employer* pays the *Consultant* for the provision of *the services* the amount due in accordance with this contract.

This Contract Agreement has been executed and delivered on the date stated at the start of this Contract Agreement.

THE CONTRACT has been signed for and on behalf of the Parties the day and year written above.

Signed by) [Redacted]

for and on behalf of) **MARINE & RISK CONSULTANTS LTD**

the *Consultant*)

[Redacted] Signature Print name and position
OPERATIONS DIRECTOR

Date: **05/06/18**

Signed by) [Redacted]

for and on behalf of) [Redacted]

the *Employer*) **SENIOR COMMERCIAL MANAGER**

Signature Print name and position

Date: **11/06/18**



CONTRACT DATA PART ONE

Part one – Data provided by the *Employer*

Statements given in all contracts

1 General

- The *conditions of contract* are the core clauses and the clauses for Main Option E, dispute resolution Option W2 and secondary Options X1, X2, X9, X10 and X11 of the NEC3 Professional Services Contract (April 2013) together with and as amended by the amendments set out in Schedule 1, Amendments to NEC3 Professional Services Contract
- The *Employer* is
Name **Transport for London**
Address **55 Broadway, London SW1H 0BD**
- The *Adjudicator* is
The President or Vice President or other duly authorised officer of the London Court of International Arbitration
- The *services* are
Marine engineering support for the Rotherhithe to Canary Wharf Crossing
- The *Scope* is in
Volume 2 – The Scope
- The *language of this contract* is **English**
- The *law of the contract* is the **law of England and Wales**
- The *period for reply* is **2 weeks**
- The *period for retention* is **6 years following Completion or earlier termination**
- The *tribunal* is the **courts of England and Wales**
- The following matters will be included in the Risk Register
Not applicable

2 The Parties' main responsibilities

- The *Employer* provides access to the following persons, places and things
access to _____ access date _____

3 Time

The *starting date* is **9 May 2018**
The *Consultant* submits revised programmes at intervals no longer than **4 weeks**

4 Quality

- The quality policy statement and quality plan are provided within **6 weeks** of the Contract Date.



5 Payment

- The *defects date* is **52 weeks** after Completion of the whole of the *services*
- The *assessment interval* is **4 weeks**
- The *currency of this contract* is **pounds Sterling (£)**
- The *interest rate* is **2 %** per annum (not less than 2) above the **base** rate of the Bank of England.
- The amounts of insurance and the periods for which the *Consultant* maintains insurance are

8 Indemnity, insurance and liability

event	cover	period following Completion of the whole of the services or earlier termination
failure of the <i>Consultant</i> to use the skill and care normally used by professionals providing services similar to the <i>services</i>	£2 million in respect of each claim, without limit to the number of claims	Six years
death of or bodily injury to a person (not an employee of the <i>Consultant</i>) or loss of or damage to property resulting from an action or failure to take action by the <i>Consultant</i>	£5 million in respect of each claim, without limit to the number of claims	The duration of the Contract
death of or bodily injury to employees of the <i>Consultant</i> arising out of and in the course of their employment in connection with this contract	£5 million in respect of each claim, without limit to the number of claims	The duration of the Contract

- The *Employer* provides the following insurances
Not applicable
- The *Consultant's* total liability to the *Employer* for all matters arising under or in connection with this contract, other than the excluded matters, is limited to



Optional statements

£2 million (two million pounds only)

- The *completion date* for the whole of the *services* is **30 September 2020 with an option to extend by up to an additional year**
- The *Consultant* is to submit a first programme for acceptance within **2 weeks** of the Contract Date
- The period for payment is **4 weekly from assessment date**
- The *Consultant* prepares forecasts of the total Time Charge and *expenses* at intervals no longer than **4 weeks**

If Option X1 is used

- The *index* is the **UK Consumer Price Index**

If Option X2 is used

- The *law of the project* is the **law of England and Wales**

If Option X10 is used

- The *Employer's Agent* is
Name XXXXXXXXXX
Address **197 Blackfriars Road, London, SE1 8NJ**
- The authority of the *Employer's Agent* is
To make all decisions related to this Contract as set out in Option X10
- The *additional conditions of contract* are as detailed in **Schedule 1, Amendments to NEC3 Professional Services Contract**



SCHEDULE 1

AMENDMENTS TO NEC3 PROFESSIONAL SERVICES CONTRACT

Z1 Amendments to Core clauses and Secondary Option clauses are amended as follows.

Z1 Amendments to Core clauses and Main Option clauses

Insert a new clause:

- "11.1A No alteration or amendments for which this contract does not otherwise make provision may be made to this contract except where expressly recorded in writing by a document expressed to be supplemental to this contract and signed by the Parties."

Delete clause 11.2 and replace with:

- "11.2 (1) The Accepted Programme is the programme identified in the Contract Data or is the latest programme accepted by the *Employer*. The latest programme accepted by the *Employer* supersedes previous Accepted Programmes. Neither the Accepted Programme, nor any method statement attached to the Accepted Programme, form part of the Scope.
- (2) Completion is when the *Consultant* has
- done all the work which the Scope states he is to do by the Completion Date; and
 - corrected Defects which would have prevented the *Employer* from using the *services* and Others from doing their work.
- If the work which the *Consultant* is to do by the Completion Date is not stated in the Scope, Completion is when the *Consultant* has done all the work necessary for the *Employer* to use the *services* and for Others to do their work.
- (3) The Completion Date is the *completion date* unless later changed in accordance with this contract.
- (4) The Contract Date is the date of the Contract unless stated otherwise in the Contract Data.
- (5) A Defect is:
- a failure by the *Consultant* to Provide the Services or any part of the *services* in accordance with the Scope and the requirements of this contract; or
 - a part of the *services* (including without limitation the *Consultant's* design) which is not in accordance with:
 - the applicable law; or
 - all applicable licences and approvals; or



- the design accepted by the *Employer*.
- (6) Others are people or organisations who are not the *Employer*, the *Consultant*, the Adjudicator or any employee, Subconsultant or supplier of the *Consultant*.
- (7) The Parties are the *Employer* (which expression includes his successors in title and assigns) and the *Consultant*.
- (8) To Provide the Services means to do the work necessary to complete the services in accordance with this contract and all incidental work, services and actions which this contract requires.
- (9) The Risk Register is a register of the risks which are listed in the Contract Data and the risks which the *Employer* or the *Consultant* has notified as an early warning matter. It includes a description of the risk and a description of the actions which are to be taken to avoid or reduce the risk.
- (10) The Scope is information which
- specifies and describes the *services*; and/or
 - states any constraints on how the *Consultant Provides the Services*, and is either:
 - in the documents which the Contract Data states it is in; or
 - in an instruction given in accordance with this contract.
- (11) Subconsultant means any subconsultant, subcontractor person or organisation engaged by the *Consultant* in connection with this contract.
- (12) The Time Charge is the sum of the products of each of the staff rates multiplied by the total staff time appropriate to that rate properly spent on work in this contract less Disallowed Time Charge.
- (13) Background Intellectual Property Rights means Intellectual Property Rights owned by the *Consultant* or a Subconsultant or other third party and which is not assigned to the *Employer*.
- (14) British Standards means those standards produced by the British Standards Institution (or any successor body) of 389 Chiswick High Road, London, United Kingdom.
- (15) CDM Regulations are the Construction (Design and Management) Regulations 2015 with any requirements issued from time to time by the Health & Safety Executive.
- (16) Connected Persons means all and any of the *Consultant's* employees, directors, contractors, agents, Subconsultant's suppliers, shareholders, professional advisers (including lawyers, auditors, financial advisers, accountants and technical consultants) or underwriters.
- (17) Contractor means the person(s), firm(s) or company(s) employed by the *Employer* to carry out and complete certain works and/or services or part(s) thereof in relation to the Works.
- (18) Disallowed Time Charge means any item which:
- the *Consultant* is unable to demonstrate has been reasonably and



- properly incurred by the *Consultant* for the purposes of this contract,
- is attributable to a compensation event under a subcontract which is not also a compensation event under this contract,
 - is a result of strikes, riots and civil commotion confined to the *Consultant's* staff,
 - and any item which is based upon staff time which is not justified by the *Consultant's* accounts and records,
 - is incurred under a subcontract entered into in breach of sub clause 24.2,
 - was incurred only because the *Consultant* did not follow an acceptance or procurement procedure stated in the Scope; or
 - give an early warning which this contract required him to give; and
 - is incurred in preparation for and/or conduct of an adjudication, arbitration or legal proceedings in connection with a Dispute.
- (19) Dispute means any dispute, controversy or claim arising out of or in connection with this contract.
- (20) European Standards means those standards ratified by the European Committee for Standardization (CEN) of Rue de Stassart, 36, B 1050 Brussels, Belgium, the European Committee for Electrotechnical Standardization (CENELEC) of F - 06921, Sophia Anipolis Cedix, France or the European Telecommunications Standards Institute (ETSI) of Rue de Stassart, 36 1050 Brussels, Belgium.
- (21) Good Industry Practice means, in respect of any aspect of the work being undertaken by the *Consultant* and subject always to its statutory safety obligations, whilst always ensuring that risks are reduced to a level which is as low as is reasonably practicable (ALARP), the exercise of the degree of skill, competence, diligence, prudence and foresight and practice which could reasonably and ordinarily be expected from a skilled and experienced person engaged in
- carrying out the same type of obligations as the *Consultant* under this contract with respect to such aspect of his work; or
 - carrying out obligations, whether individually or as a package of obligations, which could reasonably be regarded as being comparable to the responsibilities of the *Consultant* under this contract with respect to such aspect of his work,
- in each case, performing his obligations under the same, reasonably comparable or similar circumstances and utilising all the information available at the relevant time.
- (22) Indirect Subconsultant means any Subconsultant of whatever tier appointed in relation to the services.
- (23) Insolvency means (in the case of a company or partnership) the making of a winding-up order against it, the appointment of a provisional liquidator, the passing of a resolution for winding-up (other than in order to amalgamate or reconstruct without insolvency), the making of an



administration order against it, the appointment of a receiver, receiver and manager, or administrative receiver over the whole or a substantial part of its undertaking or assets, or the making of an arrangement with its creditors or (in the case of an individual) the presentation of a petition for bankruptcy, the making of a bankruptcy order against him, the appointment of a receiver over his assets or the making of an arrangement with his creditor.

- (24) International Standards means those standards produced by the International Standards Organisation or the International Electrotechnical Commission of 3 Rue de Varembe, CH1211, Geneva 20, Switzerland.
- (25) Intellectual Property Rights means intellectual property rights including patents, trade marks or names, service marks, trade names, design rights (in each case whether registered or unregistered), copyright (including rights in computer software and databases), moral rights, rights in know-how, rights in domain names, rights in passing off, database right, rights in commercial or technical information, any other rights in any invention, discovery or process and any other intellectual property rights, (including any professional, manufacturer's or supplier's warranties and/or indemnities) in each case whether registered or unregistered, and including applications for the grant of any such rights and all rights or forms of protection having equivalent or similar effect anywhere in the world.
- (26) Losses means all costs (including legal costs and costs of enforcement) whatsoever or howsoever arising, expenses, liabilities (including any tax liability), injuries, direct, indirect or consequential loss (all three of which terms include pure economic loss, loss of profits, loss of business, depletion of goodwill and like loss), damages, claims, demands, compensation, proceedings and judgments.
- (27) Main Contract means the contract (if any) agreed or to be agreed between the *Employer* and the Contractor (including all Appendices Schedules and Annexures and amendments thereto and any documents or data referred to therein) for the provision of certain works in relation to the Works.
- (28) Main Contract Works means all and any works carried out or to be carried out under the Main Contract.
- (29) Prevention Event has the meaning ascribed to that term in clause 18.1.
- (30) Safety Breach means a material breach of the contract caused by the gross incompetence or wilful default of the *Consultant* or any Subconsultant (or anyone employed or acting on behalf of the *Consultant* or any Subconsultant) or any of his agents which has materially affected the safe operation of TfL Premises, GLA Premises, or Functional Body Premises, Borough Premises or the safety of the *Employer's* customers, staff or any other person.
- (31) Standards means the individual requirements contained within standards documents issued to the *Consultant* by the *Employer* and/or specified in the Scope.



- (32) A Statutory Requirement is
- any Act of Parliament,
 - any instrument, rule or order made under any Act of Parliament,
 - any regulation or bylaw of any local authority or of any Statutory Undertaker which has any jurisdiction with regard to the services or with whose systems the same are or will be connected including any statutory provisions; and
 - any decisions of a relevant authority under the statutory provisions which control the right to develop the site of the Works in connection with which the services are to be provided (including, without limitation, any planning permission).
- (33) Statutory Undertaker means any governmental or local authority or statutory undertaker:
- which has any jurisdiction with regard to the services and/or the Works including without limitation any jurisdiction to control development of the site or any part of it,
 - with whose requirements the *Employer* is accustomed to comply; or
 - with whose systems and/or utilities the Works and/or the services will be associated.
- (34) TfL Group means Transport for London ("TfL"), a statutory body set up by the Greater London Authority Act 1999 and all of its subsidiaries and their subsidiaries (as defined in Section 1159 of the Companies Act 2006) from time to time, together with Crossrail Limited (company number 04212657) and reference to any "member of the TfL Group" refers to TfL or any such subsidiary.
- (35) TfL Premises are any premises owned, leased or under the control of any member of the TfL Group.
- (36) The Works are the works to which the services relate, as more particularly shown, described or referred to in the Scope, including any changes made to those works.
- (37) Contract Information means (i) the Contract in its entirety (including from time to time agreed changes to the Contract) and (ii) data extracted from the invoices submitted pursuant to Clause 5 which shall consist of the Consultant's name, the expenditure account code, the expenditure account code description, the document number, the clearing date and the invoice amount;
- (38) Transparency Commitment means the transparency commitment stipulated by the UK government in May 2010 (including any subsequent legislation) in accordance with which the Employer committed to publishing its contracts, tender documents and data from invoices received."
- (39) The Price for Services provided to Date is the Time Charge for the work which has been completed.
- (40) The Prices are the Time Charge.



Secondary Option clauses

Option X2: Changes in the law

Changes in the law X2

Delete X2.1 and replace with

"X2.1 A change in the *law of the project* (and which is not a change in law which a competent and experienced consultant familiar with works similar to the *services* and exercising the foresight appropriate to such a consultant ought, or ought reasonably to have, anticipated at the Contract Date) is a compensation event if it occurs after the Contract Date. Either Party may notify the other of a compensation event for such a change in law. If the effect of a compensation event which is such a change in law is to reduce the total Time Charge, the Prices are reduced."

Employer's Agent X10

Delete X10.1 and X10.2 and replace with

"X10.1 The *Employer's Agent* acts on behalf of the *Employer* with the authority set out in this Option X10 or as otherwise stated in the Contract Data.

X10.2 Except to the extent that the *Employer* may otherwise specify by written notice to the *Consultant* or as otherwise stated in the Contract Data, the *Employer's Agent* has full authority to receive and issue applications, certificates, consents, instructions, notices, requests or statements and otherwise to act for the *Employer* under any of the *conditions of contract*. All instructions from the *Employer's Agent* are in writing and signed by the *Employer's Agent*. For the avoidance of doubt the *Employer's Agent* does not have the authority to vary the *conditions of contract*."

Insert a new clause X10.3

"X10.3 The *Employer* may replace the *Employer's Agent* after he has notified the *Consultant* of the name of the replacement."



Termination by the Employer

X11

Insert a new clause X11.2

*X11.2

If the Employer terminates for a reason not stated in this contract, an additional amount is due on termination which is 5% of the difference between

- the forecast of the final total of the Prices in the absence of termination and
- the total of the other amounts and costs included in the amount due on termination."



22 Additional Core clauses

Insert a new clause:

"The Housing Grants, Construction and Regeneration Act 1996 **100**

- 100.1 The Act is the Housing Grants, Construction and Regeneration Act 1996 as amended by the Local Democracy, Economic Development and Construction Act 2009.
- 100.2 Pay Less Notice means the notice referred to in clause 100.4.
- 100.3 The *Employer's* certificate issued under clause 51.4 is the *Employer's* notice of payment specifying the amount due at the payment due date (the notified sum) and stating the basis on which that sum is calculated.
- 100.4 If either Party intends to pay less than the notified sum he notifies the other Party not later than one day (the prescribed period) before the final date for payment by stating the amount considered to be due and the basis on which that sum is calculated. In the case of the *Employer*, the notice may be given on his behalf by the *Employer's Agent*.
- 100.5 A Party does not withhold payment of an amount due under this contract unless he has notified his intention pay less than the notified sum as required by this contract.
- 100.6 If a certificate is not issued by the *Employer* in accordance with clause 51.4, the sum to be paid by the *Employer* is, subject to clause 100.4 the sum stated as due in the *Consultant's* assessment in accordance with clause 50.1.
- 100.7 If the *Consultant* is entitled to suspend performance and exercises his right under the Act to suspend performance, it is a compensation event whether or not the event has been notified by the *Consultant* within the period specified in clause 61.3.
- 100.8 If the *Consultant's* employment is terminated under clause 90.1 because the *Consultant* has become insolvent within the meaning of Section 113 of the Act, the *Employer* need not pay any sum due to the



Contractor other than any amount due to him under clause 92.1 either

- where the *Consultant* becomes insolvent prior to the prescribed period before the final date for payment, provided that the *Employer* or *Employer's Agent* issues a Pay Less Notice notifying the *Employer's* intention not to pay such sum; or
- in any prescribed event, if the *Consultant* becomes insolvent after the prescribed period before the final date for payment."

"Confidentiality, Announcements and Transparency 200

200.1 The *Consultant* shall keep confidential:

200.1.1 the terms of this contract; and

200.1.2 any other confidential information that it may acquire in relation to the *Employer*.

200.2 The *Consultant* will not use the contract or any *Employer's* confidential information for any purpose other than to perform its obligations under this contract. The *Consultant* will ensure that its officers and employees comply with the requirements of Clause 200.

200.3 The obligations on the *Consultant* set out in this Clause 200 will not apply to any confidential information which:

200.3.1 either of the parties can demonstrate is in the public domain (other than as a result of of this Clause 200); or

200.3.2 a party is required to disclose by order of a court of competent jurisdiction but then only to the extent of such required disclosure; or

200.3.3 to the extent that such disclosure is to the Secretary for Transport (or the government department responsible for public transport



in London for the time being) the Office for Rail Regulation, or any person or body who has statutory responsibilities in relation to transport in London and their employees, agents and subcontractors.

- 200.4 The *Consultant* shall keep secure all materials containing any information in relation to this contract and its performance.
- 200.5 The *Consultant* shall not communicate with representatives of the general or technical press, radio, television or other communications media in relation to the existence of this contract or that it is providing the *services* to the *Employer* or in relation to any matter under or arising from the contract unless specifically granted permission to do so in writing by the *Employer*. The *Employer* shall have the right to approve any announcement before it is made.
- 200.6 The *Consultant* acknowledges that the *Employer* is subject to the transparency commitment. Accordingly, notwithstanding Clause 200.1, the *Consultant* hereby gives its consent for the *Employer* to publish the Contract Information to the general public.
- 200.7 The *Employer* may in its absolute discretion redact all or part of the contract prior to its publication. In so doing and in its absolute discretion the *Employer* may take account of the exemptions/exceptions that would be available in relation to information requested under the Freedom of Information Legislation. The *Employer* may in its absolute discretion consult with the *Consultant* regarding any redactions to the contract to be published pursuant to Clause 200.6. The *Employer* shall make the final decision regarding publication and/or redaction of the contract.
- 200.8 The provisions of this Clause 200 will survive any termination of this contract for a period of 12 years from termination."



ANNEX A1 – PREAMBLES TO PRICING SCHEDULE

The Pricing Schedule is located in Contract Data Part 2.

Preambles

- a. The *Consultant* is To Provide the Services set out in the Scope.
- b. All *Consultants'* expenses shall be deemed as included in the staff rates. This includes but is not limited to travel, accommodation, food, etc.
- c. The *Consultant* shall provide rates for all staff proposed in line with the co-location requirements as stipulated in Volume 2, the Scope.
- d. All rates shall exclude VAT.
- e. The Pricing Schedule is based on Time Charge pricing and as such is to be completed by providing rates for all individuals charging time.
- f. The *Consultant* shall add extra rows as necessary to the Pricing Schedule to include all named individuals.
- g. Staff Designation/Disciplines/Grades shall match those found Annex A2, and their competencies shall match the descriptions shown. The Pricing Schedule shall clearly highlight the Staff Discipline.
- h. Candidates named in the Pricing Schedule shall correspond and be identified to the CV(s) included in the *Consultant's* Proposal and correspond to the consultant grade descriptions described in Annex A2.
- i. The rates submitted in the Pricing Schedule within this Contract will be reviewed on the first anniversary of the Contract *starting date* and each subsequent anniversary during the duration of the Contract. On each such review, the rates included in the Schedule of Rates only are adjusted by the index stated in Contract Data Part 1.
- j. The expert witness does not need to be categorised into a grade as per Annex A2.



ANNEX A2 – CONSULTANT GRADE DESCRIPTION

Partner/Director

<p>General</p>	<p>For a partnership, a Partner in the practice; for a limited company, any employee who carries the title "Director" (or "Associate Director" or other similar title) and who is normally chargeable to projects. Member of a company generally in overall charge of the management, policy and conduct of the firm's business including maintaining effective communication channels and is able to commit the company to undertake all major contracts.</p> <p>Responsible for all grades of personnel.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several major programmes. • The ability to demonstrate key involvement in delivering projects of high value and complexity. • Overall responsibility for project(s) and for supervision, control and development of subordinate personnel. • Significant management responsibility and direction within the consultancy including client liaison, specialist skills or experience.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Develop client relationships. • Review enquiries for consultancy services, prepare fee proposals and negotiate commissions. • Manage and control all the personnel efficiently, and in compliance with all relevant statutory instruments procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Develop and maintain effective communication channels, between the consultancy and TfL and external contractors and other bodies as necessary. • Ensure that sufficient personnel are assigned for the commission and that they are suitably qualified and motivated to perform the duties allocated to them. • Oversee all commission activities and ensure full adherence. • Comply with all the projects safety and quality assurance procedures and requirements, including audits, and ensure that all consultancy personnel do likewise. • Facilitate and ensure that training needs, both personal and that of the consultancy personnel, are identified and addressed.



Principal Consultant

<p>General</p>	<p>Reporting to Partner / Director. Member of a company who is able to deputise for the Director. The person will have the ability to manage and control teams and ensure that there are sufficient teams of personnel assigned to commissions. Responsible for all grades of consultants and support staff.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several programmes. • The ability to demonstrate key involvement in delivering projects of high value and complexity. • Must have substantial transport experience and technical skills appropriate to the sub-category. • Responsibility for project(s) and for supervision, control and development of junior personnel. • Significant management responsibility and direction within the Consultancy including client liaison, specialist skills or experience.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Deputise for the Partner/Director on all aspects of the project. • Manage and control a team(s) of consultants effectively and in compliance with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Communicate effectively with other members of the project team and with other TfL departments and external consultants and bodies where necessary. • Ensure that sufficient personnel are assigned for the commission and that they are suitably qualified and motivated to perform the duties allocated to them. • Supervise, control and develop personnel assigned • Ensure that the team's activities meet the objectives of the commission. • Comply with all the project's safety and quality assurance procedures and requirements and ensure that all team members do likewise. • Ensure that all appropriate training, both personal and that the team personnel, is undertaken.



Senior Consultant

<p>General</p>	<p>Reporting to Partner / Director or Principal Consultant. Person holding corporate membership of a professional body recognised by TfL and has the ability to demonstrate key involvement in delivering projects of high value and complexity. Responsible for all grades of consultants and support staff on behalf of the Director/Partner.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several programmes / projects • The ability to demonstrate key involvement in delivering projects of high value and complexity. • Must have substantial transport experience and technical skills appropriate to the sub-category. • Responsibility for project(s) and for supervision, control and development of junior personnel. • Significant management responsibility and direction within the organisation including client liaison, specialist skills or experience.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Deputise for the Partner/Director or Principal Consultant on all aspects of the Project. • Manage and control a team(s) of consultants effectively and in compliance with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Communicate effectively with other members of the Project Team and with other TfL departments and external consultants and bodies where necessary. • Ensure that sufficient personnel are assigned for the commission and that they are suitably qualified and motivated to perform the duties allocated to them. • Supervise, control and develop personnel assigned • Ensure that the team's activities meet the objectives of the commission. • Comply with all the project's safety and quality assurance procedures and requirements and ensure that all team members do likewise. • Ensure that all appropriate training, both personal and that the team personnel, is undertaken.



--	--

Consultant

General	Reporting to Principal Consultant / Senior Consultant. A person with the ability to assist in the management and control of a project team to ensure delivery of the required projects. Responsible for Junior Consultant / administration staff
Typical Education /Qualifications and Experience	<ul style="list-style-type: none"> • Hold appropriate professional qualifications applicable to the sub-category commissioned to perform and/or corporate membership of a major institution. • Must have relevant work experience spanning several projects • Must have some transport experience and technical skills appropriate to the sub-category. • Responsibility for project(s) and for supervision, control and development of junior personnel.
Responsibilities	<ul style="list-style-type: none"> • Deputise for the Principal Consultant/ Senior Consultant on all aspects of the project. • Assist in the management and control of a project team of consultants to ensure efficiency and compliance with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Communicate effectively with other members of the Project Team and with other TfL departments and external consultants and bodies as necessary. • Supervise, control and develop personnel assigned. • Ensure that own and assigned personnel activities meet the objectives of the commission. • Comply with all safety and quality assurance requirements and ensure that all team personnel to likewise • Ensure that all appropriate training, both personal and that of assigned personnel, is undertaken.



Junior consultant

<p>General</p>	<p>Reporting to Senior Consultant/Consultant. A person with the relevant experience capable of working on some aspects of the delivery of the required project. Responsible for support staff.</p>
<p>Typical Education /Qualifications and Experience</p>	<ul style="list-style-type: none"> • Must have relevant work experience in at least one completed project.
<p>Responsibilities</p>	<ul style="list-style-type: none"> • Assist the Consultant where appropriate. • Supervise the support staff assigned (if appropriate). • Work in compliance and ensure that all assigned personnel comply with all relevant procedures, rules, regulations, standing orders and instructions and the adopted procurement method. • Ensure that own and assigned personnel's activities meet the objectives of the commission. • Comply with all safety and quality assurance requirements and ensure that all assigned personnel do likewise. • Ensure that all appropriate personal training is undertaken.



CONTRACT DATA PART TWO

Part two – Data provided by the *Consultant*

Statements given in all contracts

Completion of the data in full, according to the Options chosen, is essential to create a complete contract.

- The *Consultant* is

Name **Marine and Risk Consultants Ltd**

Address **Marico House, Bramshaw, Lyndhurst,
Hampshire, SO43 7JB**

- The *key people* are

(1) Name **Dr [REDACTED]**

Job **Operations Director**

Responsibilities **Strategically and ultimately responsible for execution of Marico Marine tasks to scope schedule and budget.**

Qualifications **CEng CMarEng, MIMarEST**

Experience **15 years**

(2) Name **[REDACTED]**

Job **Associate Director**

Responsibilities **Operationally responsible for delivery of Marine tasks to scope, schedule and budget including sub-contract management of HR Wallingford.**

Qualifications **BSc (Hons), MSc, CEng MIMarEST**

Experience **10 years**

(3) Name **Cmdr. [REDACTED]**

Job **Principal Consultant**

Responsibilities **Marine pilotage expert with significant knowledge of large ship maneuverability.**

Qualifications **MNI**

Experience **30+ years**

(4) Name **Cmdr. [REDACTED]**

Job **Principal Consultant**

Responsibilities **Harbour Master and River Thames navigation experience.**

Qualifications **MVO**

Experience **30+ years**



(5) Name Dr [REDACTED]

Job Simulation Manager

Responsibilities Ship motion and offshore applications including vessel maneuvering, ship mooring and port/terminal operations.

Qualifications DPhil, BSC (Hons), Diploma of Industrial Studies

Experience 30+ years

- The *staff rates* are
In the attached *Consultant's Financial Submission* dated 13 April 2018.
- The following matters will be included in the Risk Register

• **Optional statements**

If the *Consultant* requires additional access

- The *Employer* provides access to the following persons, places and things

access to	<i>access date</i>
.....
.....



TRANSPORT FOR LONDON

**PROPOSAL: ROTHERHITHE TO CANARY WHARF RIVER
CROSSING - MARINE ENGINEERING SUPPORT: FINANCIAL
ASSESSMENT**



Report Number: 18UK1421
Issue: 02
Date: 13 April 2018



MARINE AND RISK CONSULTANTS LTD

TRANSPORT FOR LONDON

PROPOSAL: ROTHERHITHE TO CANARY WHARF RIVER CROSSING - MARINE ENGINEERING SUPPORT: FINANCIAL ASSESSMENT

Prepared for: Transport for London
Palestra
197 Blackfriars Road
London
SE1 8NJ

Author(s):

Checked By:

Date	Release	Prepared	Authorised	Notes
19 March 2018	Issue 01			Issue 01
13 April 2018	Issue 02			Updated Annex A as per tender clarification dated 10-Apr-18

Marine and Risk Consultants Ltd
Marico Marine
Bramshaw
Lyndhurst
Hampshire
SO43 7JB
United Kingdom

Tel. + 44 (0) 2380 811133

13 April 2018

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1 CONTRACT DATA PART 2 – MS WORD FORMAT

The Pricing Schedule in MS Word Format is submitted separately as per Annex B1 of the Invitation To Tender Volume 0 – Instructions To Tenderers.

Ref: *he_tfl_scp_001762_Sub-C_Fin_Assess_Pricing_Schedule_MS_Word_Issue02*

2 CONTRACT DATA PART 2 – PDF FORMAT

The Pricing Schedule in MS Word Format is submitted in Annex A of this document as per Annex B1 of the Invitation To Tender Volume 0 – Instructions To Tenderers.

3 FREEDOM OF INFORMATION – RESERVED INFORMATION

The Freedom of Information Pricing Schedule in MS Word Format is submitted in Annex B of this document as per Annex B1 of the Invitation To Tender Volume 0 – Instructions To Tenderers.

4 FORM OF TENDER - SIGNED

The signed form of tender is submitted in Annex C of this document as per Annex B1 of the Invitation to Tender Volume 0 – Instructions to Tenders.

Annex A Pricing Schedule - Schedule of Rates

Schedule of Rates			
STAFF	ROLE	NAME	RATE/DAY
DESIGNATION/GRADE			
Expert Witness - Director	Expert Witness - Navigation Risk	Dr [REDACTED]	
Expert Witness - Principal Consultant	Expert Witness - Harbour Master	Cdr [REDACTED]	
Expert Witness - Principal Consultant	Expert Witness - Marine Pilot	Cdr [REDACTED]	
Expert Witness - Technical Director	Expert Witness - Ship Simulation	Dr [REDACTED]	
Expert Witness - Consultant	Expert Witness - Risk Modelling	[REDACTED]	
Partner/Director or equivalent	Project Director	Dr [REDACTED]	
Partner/Director or equivalent	Technical Director	Dr [REDACTED]	
Partner/Director or equivalent	Project Manager	[REDACTED]	
Principal Consultant	Harbour Master	Cdr [REDACTED]	
Principal Consultant	Harbour Master	Lt Cdr [REDACTED] [REDACTED]	
Principal Consultant	Marine Pilot	Cdr [REDACTED]	
Senior Consultant	Senior Data Analyst	[REDACTED]	
Consultant	Data Analyst	[REDACTED]	
Consultant	Data Analyst	[REDACTED]	

Junior Consultant / Graduate	GIS/Data Technician	[REDACTED]
------------------------------	------------------------	------------

OPTION - Schedule of Rates for Requirement 2 - Marine (Simulation) Modelling - OPTON

DESIGNATION	SCOPE REQUIREMENT 2	TASK	TASK CONSTITUENT ELEMENTS	RESOURCE 1			RESOURCE 2			RESOURCE 3			FIXED PRICE ITEMS		
				STAFF	RATEDAY	NO. DAY	STAFF	RATEDAY	NO. DAY	STAFF	RATEDAY	NO. DAY	ITEM	COST	
				Configure bridge navigation simulator and review existing model basis Incorporate/update local area hydrodynamics with environmental consultant outputs Endorse/validate and update local area geometry Update visual scene as required Select and endorse design vessels (ship & tug). Test, QA and validate simulator											
				Setup/amend a simulation model for the study area (LUMP SUM COST)											
Marine (Simulation) Modelling	Scope Requirement 2														
				Assess provided bridge design Translate bridge design and updates into simulator geometry Update visual scene QA											
Marine (Simulation) Modelling	Scope Requirement 2	Creating bridge model (per design layout) (LUMP SUM COST)													
				Simulation facilitation team - (inc. data extracts) w. Operator & experienced Facilitator											
Marine (Simulation) Modelling	Scope Requirement 2	Day rate for simulation (RATEDAY)													

Annex B Freedom of Information



GUIDANCE TO TENDERERS AND CONTRACTORS ON THE EMPLOYER'S POLICY FOR ACCESS TO INFORMATION

BACKGROUND

The Freedom of Information Act 2000 (FOIA) gives the public a legal right of access to information held by public authorities. The public now has a right to know about our work and it is our duty to operate with openness and transparency.

A person making a FOIA request is entitled to two things, unless an exemption applies. These are:

- a) To be informed whether we hold information of the description requested; and
- b) If so, to have that information communicated to him or her.

HOW DOES THIS AFFECT YOU?

All information held by

The Employer is caught by the FOIA. The rules about disclosure apply regardless of where the information originated. This means that all the following types of information may be subject to disclosure:

- Information in any tender submitted to us;
- Information in any contract to which we are a party (including information generated under a contract or in the course of its performance);
- Information about costs, including invoices submitted to us;
- Correspondence and other papers generated in any dealing with the private sector whether before or after contract award; and
- This means *the Employer* will be obliged by law to disclose such information unless an exemption applies.

The legal obligation to respond to requests from the public under the FOIA rests with the Employer. *The Employer* must therefore respond to requests as we see fit in our sole discretion. This guidance explains our policy on the disclosure to the public of information about our private sector suppliers.

GENERAL RULES ON DISCLOSURE

In the absence of special circumstances:

- c) All Invitations to Tender published by *the Employer* will be available to the public on request;
- d) Responses to tenders will be held in confidence until award;
- e) Information about the total value of bids will be made available to the public on request, but only in response to requests made after contract award.

Any person tendering for or contracting with *the Employer* must notify *the Employer* during the tendering or negotiating process of information that they consider being eligible for exemption from disclosure under the FOIA. Such notification must be made



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in the form of the appendix to this guidance note. Such information must be referred to as reserved information.

Information not identified as reserved information in the way described above will be made available by *the Employer* on request.

RESERVED INFORMATION

Information which you wish to put forward as reserved information must clearly describe, with supporting detail:

- f) The information itself, or the class(es) of information; and
- g) Why, in your opinion, that information is exempt from disclosure. Grounds for exemption may be one or more of the following:
 - The information is a trade secret;
 - The disclosure of the information would prejudice the commercial interests of any person or organisation;
 - The information will be disclosed by you to *the Employer*, and the nature of the information, or the circumstances of its disclosure, or other circumstances, justify the acceptance by *the Employer* of an obligation of confidence in relation to that information;
 - The information is personal data or otherwise relates to the private life of an individual and is therefore appropriate for protection; or
 - Any other specific exemption under the FOIA.

All decisions about disclosure of information will be made at the sole discretion of *the Employer*. The exemption that applies to trade secrets and to information that would prejudice commercial interests if disclosed is a 'qualified' exemption under the FOIA. This means that *the Employer* is required to consider whether, in all the circumstances prevailing at the time a request is received, the public interest in disclosure outweighs the public interest in upholding the exemption.

Information that is agreed by *the Employer* to be reserved information will be listed in a document that will also:

- h) Specify which exemption(s) may apply to each piece or class of information; and
- i) Indicate when it is likely information can be made available, or (if this is the case) that it is unlikely ever to be made available.

The Employer may disclose your justification for classifying information as reserved information.

Information that is exempt under the rules governing commercial matters will not normally be withheld for more than seven years after completion of the contract supply.



Transport for London

Information relating to the overall value, performance or completion of a contract will not be accepted as reserved information, although *the Employer* may choose to withhold such information in appropriate cases, at its sole discretion.

You may designate unit prices or more detailed pricing information as reserved information.

OTHER GUIDANCE

Although *the Employer* is not under any obligation to consult you in relation to requests for information made under the FOIA, we will endeavour to inform you of requests wherever it is reasonably practicable to do so.

Contracts with *the Employer* may require you to supply information to us, or provide other assistance, pursuant to any FOIA request received by *the Employer*.

You should be aware that *the Employer's* decision on applying an exemption and, therefore, refusing a request for information by a member of the public may be challenged by way of appeal to the information commissioner. The information commissioner has the statutory power to direct that the information be disclosed.

Annex C Form of Tender



I confirm and accept that:

1. The information provided in the Invitation to Tender (ITT) document for Rotherhithe to Canary Wharf River Crossing Marine Engineering Support was prepared by Transport for London ("The Employer") in good faith. It does not purport to be comprehensive or to have been independently verified. Neither *the Employer* nor any member of the TfL Group has any liability or responsibility for the adequacy, accuracy, or completeness of, and makes no representation or warranty, express or implied, with respect to the information contained in the ITT or on which such documents are based, or with respect to any written or oral information made or to be made available to any interested Supplier or its professional advisers, and any liability therefore is excluded.
2. The tender requirements of Volume 0 of the ITT have been complied with.
3. Nothing in the ITT document or provided subsequently has been relied on as a promise or representation as to the future. *The Employer* has the right, without prior notice, to change the procedure for the competition or to terminate discussions and the delivery of information at any time before the signing of any agreement.
4. *The Employer* reserves the right (on behalf of itself and its group companies) to award the contract for which tenders are being invited in whole, in part or not at all.
5. This tender shall remain open for acceptance by *the Employer* and will not be withdrawn by us for a period of 6 months from the date fixed for return.
6. The information provided by us is true and accurate.
7. I will notify *the Employer* of any actual or potential conflicts of interest in the circumstances detailed in Section 2.1 of Volume 0 of the ITT.

Having made due allowances for the full requirement in the ITT documents we hereby offer to provide the Services to *the Employer* (or any member of the TfL group) in accordance with the terms and conditions stated therein in *the Employer's Contract*.

I agree to accept the Conditions of Contract attached to this ITT.		
Name		Date
Dr [REDACTED]		16 th March 2018
Signed		
Position:	For and on behalf of (company name):	
Operations Director	Marine and Risk Consultants Ltd	
Telephone:	Facsimile:	Email:
[REDACTED]	02380811177	[REDACTED]
<i>The Employer's Reference No: tf_l_scp_001762</i>		
Surface Transport: Rotherhithe to Canary Wharf River Crossing Marine Engineering Support		



SURFACE TRANSPORT

CONTRACT

FOR

Rotherhithe to Canary Wharf Crossing – Marine Engineering Support

VOLUME 2 THE SCOPE

Project Reference Number: tfl_scp_001762

Transport for London
Palestra House
197 Blackfriars Road
London SE1 8NJ

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tfl_scp_001762, Marine Engineering Support Contract



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DOCUMENT CONTROL

Document History

Version	Date	Changes since previous issue
V0.1	Nov 2017	
V0.2	Nov 2017	CM amendment incorporated
V0.3	Dec 2017	Procurement comments
V1.0		

Final Version Approval

Authors

Name	Signature	Date	Title
[Redacted]			

Reviewed by

Name	Signature	Date	Title
[Redacted]			

Approved by

Name	Signature	Date	Title
[Redacted]			



1. ORGANISATIONAL OVERVIEW

1.1 Transport for London

Transport for London (TfL) (hereinafter called "the *Employer*") was created in 2000 as the integrated body responsible for London's transport system. The *Employer* is a functional body of the Greater London Authority. Its primary role is to implement the Mayor of London's Transport Strategy and manage transport services to, from and within London.

The *Employer* manages London's buses, the Tube network, Docklands Light Railway, Overground and Trams. The *Employer* also runs Santander Cycles, London River Services, Victoria Coach Station, the Emirates Air Line and London Transport Museum. As well as controlling a 580km network of main roads and the city's 6,000 traffic lights, the *Employer* also regulates London's taxis and private hire vehicles and the Congestion Charge scheme.

Further background on what the *Employer* does can be found on the *Employer's* website here:

<https://tfl.gov.uk/corporate/about-tfl/what-we-do>

1.2 Business Unit

This procurement of marine support services is required by the Rotherhithe to Canary Wharf Crossing (R2CW) project.

The project team has been set up to deliver the project on behalf of the *Employer's* Surface Transport Directorate.



2. INTRODUCTION

2.1 Background

The *Employer* is investigating the feasibility of providing a new pedestrian and cycling crossing of the River Thames between Rotherhithe and Canary Wharf. The new river crossing is intended to improve cross-river connectivity. The crossing will provide pedestrian and cycle links to improve access to jobs, facilitate business activity, support housing development, enhance the resilience of the transport network and encourage more sustainable travel.

The Mayor has requested that the *Employer* develop a crossing as a high priority due to the following:

- Both the Isle of Dogs and Canada Water on the Rotherhithe peninsula are designated as Opportunity Areas where significant housing and employment growth is anticipated in the coming years.
- Significant cycling growth has taken place in central and inner London.
- Central to the Mayor's Healthy Streets London vision is to encourage walking and cycling with safer and more appealing routes to create a better city for all Londoners. Improvements to cycling access and capacity are required if continued growth is to be supported, particularly for employees living in south London, for whom the options for crossing the Thames onto the Isle of Dogs (to access Canary Wharf) are limited.
- The section of the Jubilee line between Canada Water and Canary Wharf is increasingly crowded in the peak hours, however there are no convenient alternative options for travelling at surface level due to the position of these growth areas on peninsulas of the Thames. Improving the accessibility of the Rotherhithe peninsula for walking and cycling would provide existing and future residents of the area with an alternative active travel option.

A charity focusing on healthier travel, originally proposed the idea of a river crossing in this area nearly a decade ago, under plans to develop Greenways for the 2012 Olympic and Paralympic Games. They undertook a series of feasibility studies, funded by the *Employer* and other organisations, which concluded that a walking and cycling bridge from Rotherhithe to Canary Wharf would be both economically and technically viable.

In October 2016, the Mayor announced that he had asked the *Employer* to lead in the progression of the crossing.

Following the announcement, the *Employer* has reviewed the documentation produced by the charity Sustrans and carried out its own independent assessment. The *Employer* has concluded that there is a need for a crossing in this area.

The *Employer* has therefore been working to advance the crossing as quickly as possible in accordance with their programme.



A public consultation started on 8 November 2017 and closed on 8 January 2018. The *Employer* consulted the public on the *Employer's* work to date including the initial options work. It should be noted that the project is currently working on the assumption that a bridge will be progressed but is clear that the decision on type, location and form of crossing is still under review. Public opinion and new research will be used to progress the project following the consultation throughout the option selection process.

Based on the emerging preferred option of a navigable bridge, it is currently assumed that the route to acquire the consents, powers and licences required to build and operate the scheme will be through a Transport and Works Act Order. This is subject to the results of upcoming consultation and the selection of a crossing type (tunnel, enhanced ferry or bridge) by the *Employer*.

Due to the proposed location of the crossing, a bridge would have to be an opening bridge as the River Thames is navigable at this point and cannot restrict access further up the Thames to St Katherine's Dock and The Pool of London; this impacts on the design and the Scheme Designer will need to carry out further work to determine the design parameters for the crossing.



Figure 1: Possible crossing alignments

Negotiations and approvals from the Port of London Authority will be required for the crossing, in addition to their approval of how the crossing is operated to allow boats and ships through. The period and number of openings per day could have an impact on the usage (and is subject to further work by the *Employer* to identify the optimal requirements for the design).

As part of the Sustrans feasibility study into a bridge at this location, a piece of work was undertaken by Marico Marine to review shipping data to provide an indication of the volume of shipping. The *Employer* believed that this piece of work was helpful, but it was relatively limited in scope given the



early stage of the project at that time, and was principally a desk study with some limited spot observations on site.

The *Employer* undertook more detailed analysis of the vessel movements in this part of the River Thames. This data was not available from existing data sources; while the PLA could share Automatic Identification System (AIS) data collected from vessels; it was incomplete as it did not cover a large proportion of leisure vessels.

The *Employer* has carried out the following works:

Phase 1 – General Data Gathering. General Information from the *Employer's* first consultation can be located on the *Employer's* consultation website.

Phase 2 – Collection of vessel traffic data

Vessel data traffic collection is for a year (between May 2017 and April 2018) by Automatic Identification System (AIS) Data and CCTV Survey (for non-AIS vessels). See Appendix B 'Vessel Traffic Survey for the Rotherhithe to Canary Wharf Bridge Project – Monthly Report 009 (January 2018).

Phase 3 – Analysis of vessel traffic data.

The AIS data was input to a Geographical Information System (GIS) which enables a variety of plots to be produced, including the following:

- Vessel Tracks (by type/category);
- Swept Path Analysis;
- Density Analysis
- Gate Analysis; and
- Estimate of Bridge Opening Frequency.

Phase 4 – 'Outline' Navigational Risk Assessments

Preliminary 'outline' navigation risk assessments (NRA) were prepared to support the three alignments as taken to public consultation in November 2017 using the evidence based dataset. See Appendix C, 'Rotherhithe to Canary Wharf Bridge: Preliminary Navigation Risk Assessment'.

Analysis of bridge opening times, as relate to navigation implications, was undertaken and incident data (provided by the PLA and/or Maritime and Coast guard Agency) collated and analysed. Consultation was also undertaken with identified primary stakeholders including the PLA Harbour Master Upper and the PLA River Pilot (as relates to large vessels navigating in the reach).



The output is being used to assist the *Employer* in determining the most appropriate location, opening type and mechanism for a bridge option.

An engineering and architectural services consultant (Scheme Designer) is currently being procured to undertake design development through the TWAO consent process. Their works will take the agreed option and produce a design sufficient to describe the performance and technical requirements, support the TWAO application, assist the public consultation on the single preferred option and compile the tender specification for a design and build contractor.

2.2 Objective

The overall objective of this commission is to support the *Employer* throughout the conceptual design process to ensure proposals are acceptable to the PLA who is a key stakeholder in the project.



3. SCOPE

3.1 Specific Requirements

Requirement 1 – Stakeholder Negotiation

The *Consultant* provides experience, expertise and support in relation to operations on the River Thames and the PLA licencing/approvals process to assist the *Employer* in their negotiations with PLA and any other stakeholder concerned with marine issues. The *Employer's* environmental consultant is leading on production of a hydrological model which will review scour, deposition and impact on flood defences. The 'marine issues' term primarily involves navigational issues but could also encompass items such as operational impact on marine traffic and navigation.

Typically, a day of preparation work at the *Employer's* office prior to each meeting between PLA and the *Employer* is envisaged. Assumed 6 meetings but more could be arranged depending on complexity of negotiations with PLA. No other stakeholder meetings are envisaged at this time although they may arise.

The *Employer* will lead with stakeholder interfaces but the *Consultant* will be expected to engage with other workstreams undertaken by the project team.

The *Consultant* provides experienced support within his core team for the following areas:

- Understanding of PLA processes including licencing/approvals
- Experienced Mariner
- Experience of carrying out Navigational Risk Assessments
- Harbour Master role or equivalent
- Knowledge of a large/wide navigable river

Support will also include the *Consultant* interfacing with the *Employer* and his main engineering/design consultant and consultants carrying out other assessments as part of the TWAO application (mainly environment e.g. hydrodynamic modelling).

Requirement 2 – Marine Modelling

The *Employer's* environmental consultant will lead on creating a hydrodynamic model.

The *Consultant* will provide resource to liaise with the *Employer's* environmental consultant and any of their subcontractors (e.g. creator of the model). The *Consultant* leads on establishing a marine model to simulate different design scenarios. Simulations will help confirm design parameters



e.g. pier location, sizing, etc. The *Consultant* will also facilitate a structured workshop/s to refine the design and control/ design-out risks. The workshop is likely to include the modellers, TfL, the PLA, an environmental consultant and the *Employers* environmental consultant and scheme designer. Furthermore, the *Consultant* provides any experts required for inputs into the simulations e.g. towage expert where not provided by others. The *Consultant* liaises with the environmental consultant via the *Employer* to ensure tasks are not duplicated and liaises with the modellers prior to the workshops to ensure the models are accurate and scenarios reasonable before stakeholders such as the PLA are involved. It is currently understood that two workshops will be required with a day preparation with the modellers. The workshops will take place as soon as the *Employer's* scheme designer has sufficient detail on the form of construction including pier location, size and deck height, currently estimated in May/June 2018. These assumptions may change following liaison with a modeller, scheme designer and discussions with the *Employer*.

The *Consultant* is to undertake any additional marine surveys, data analysis and modelling to support the *Employer* and answer requirements of the PLA during negotiations.

Requirement 3 – Navigational Risk Assessments

The *Consultant* produces Navigational Risk Assessments (NRA) and other work to support the PLA licencing/approvals process which is expected to follow four principle phases. The first phase is currently being progressed and only a review of the output will be required prior to starting phase 2.

- (i) Preliminary NRA to support the three designs as will go to public consultation. (NOTE: This first phase has been completed and is not required under this contract; it is noted to clarify the phases in the process). The assessment is included in the supporting information to this tender;
- (ii) Additional NRA to support the single preferred option that will go to a second public consultation;
- (iii) 'Full' NRA and any other work to support the protective provisions (licence application) sought in the TWAO application. Other deliverables, advice and support may be required through preparation of the suite of application documents (e.g. discrete technical notes to explain the approach to vessel modelling); and
- (iv) support through the TWAO determination period and public inquiry to assist in responding to any issues raised in relation to this topic.



The NRA shall follow formal FSA standards and utilising the PLA adopted and approved methodology.

Requirement 4 – Expert Witness

If required by the TWAO inquiry process, the *Consultant* provides an expert witness to answer questions related to marine engineering and support the process. Items such as scour, deposition and flood defence are not required to be covered by the Marine Support Expert Witness and will be led by the *Employer's* Environmental Consultant Expert Witness. The Marine Support Expert Witness scope will include movement of vessels/navigation and items such as operational impact on marine traffic and navigation.

3.2 General Requirements

Progress Reporting

The *Consultant* submits a periodic summary report of project progress to the *Employer* every four (4) weeks. The periodic report contents shall cover progress to match the *Employer's* periods as shown in Appendix A. The report must include:

- A progress statement by reference to the accepted programme for the Services;
- Details of any matters materially affecting the regular progress of the Services; and
- Key activities planned for the following three (3) months.

Finance Reporting

The *Consultant* submits a finance report on the Wednesday of week four of each period (unless change is agreed with the *Employer*) detailing:

- a) Value of work done (VOWD)/planned for each *Employer* reporting period estimated from the start to the end of the works.
- b) Cumulative/ total VOWD to-date
- c) Explanation of variance from the forecast
- d) Invoice totals and associated dates

The *Consultant* submits payment applications on the Monday or Tuesday of week four each period.



When invoicing for payment, the *Consultant* shall send the application to:

TfL Surface Transport

Accounts Payable

PO Box 45276

14 Pier Walk

London, SE10 1AJ

When invoicing for payment, the *Consultant* includes the following information:

- Back up information to substantiate any claim for payment i.e. invoices, plant/labour/materials returns, test results. Failure to provide full substantiation could delay payment.

Collaboration

The following is applied throughout the project by all parties:

- building a collaborative project environment
- ensuring clear understanding of roles and responsibilities
- ensuring integration by undertaking specific and measurable methods of working
- promoting collaborative behaviours
- seeking continuous improvement through effective communication and engagement with all stakeholders



4. DELIVERABLES / MILESTONES

Milestones are linked to the programme and subject to change.

From Requirement 3:

Phase ii)

Acceptance of 'additional' NRA assessment by the *Employer*

At or Before Q2 (May-Aug) 2018

Phase iii)

Acceptance of 'full' NRA assessment by the *Employer* prior to TWAO submission

At or Before Q1 (Jan-Mar) 2019

Further deliverables and milestones will be agreed at the project start up meeting if required.



5. PROJECT PLAN/TIMESCALES

The current programme is subject to change and timescales may change.

Engineering and Architectural Services Consultant Award	Mar 2018
Final Consultation	August 2018
TWAO Consent Application	May 2019
Order Public Enquiry	Nov 2019
TWAO Decision	Sept 2020



APPENDIX A

Period Dates

Select Financial Year:	2017-18
------------------------	---------

Period 1	Start	Finish	Period 2	Start	Finish	Period 3	Start	Finish	Period 4	Start	Finish
Week 1	01/04/2017	08/04/2017	Week 1	30/04/2017	06/05/2017	Week 1	28/05/2017	03/06/2017	Week 1	25/06/2017	01/07/2017
Week 2	09/04/2017	15/04/2017	Week 2	07/05/2017	13/05/2017	Week 2	04/06/2017	10/06/2017	Week 2	02/07/2017	08/07/2017
Week 3	16/04/2017	22/04/2017	Week 3	14/05/2017	20/05/2017	Week 3	11/06/2017	17/06/2017	Week 3	09/07/2017	15/07/2017
Week 4	23/04/2017	29/04/2017	Week 4	21/05/2017	27/05/2017	Week 4	18/06/2017	24/06/2017	Week 4	16/07/2017	22/07/2017

Period 5	Start	Finish	Period 6	Start	Finish	Period 7	Start	Finish	Period 8	Start	Finish
Week 1	23/07/2017	29/07/2017	Week 1	20/08/2017	26/08/2017	Week 1	17/09/2017	23/09/2017	Week 1	15/10/2017	21/10/2017
Week 2	30/07/2017	05/08/2017	Week 2	27/08/2017	02/09/2017	Week 2	24/09/2017	30/09/2017	Week 2	22/10/2017	28/10/2017
Week 3	06/08/2017	12/08/2017	Week 3	03/09/2017	09/09/2017	Week 3	01/10/2017	07/10/2017	Week 3	29/10/2017	04/11/2017
Week 4	13/08/2017	19/08/2017	Week 4	10/09/2017	16/09/2017	Week 4	08/10/2017	14/10/2017	Week 4	05/11/2017	11/11/2017

Period 9	Start	Finish	Period 10	Start	Finish	Period 11	Start	Finish	Period 12	Start	Finish
Week 1	12/11/2017	18/11/2017	Week 1	10/12/2017	16/12/2017	Week 1	07/01/2018	13/01/2018	Week 1	04/02/2018	10/02/2018
Week 2	19/11/2017	25/11/2017	Week 2	17/12/2017	23/12/2017	Week 2	14/01/2018	20/01/2018	Week 2	11/02/2018	17/02/2018
Week 3	26/11/2017	02/12/2017	Week 3	24/12/2017	30/12/2017	Week 3	21/01/2018	27/01/2018	Week 3	18/02/2018	24/02/2018
Week 4	03/12/2017	09/12/2017	Week 4	31/12/2017	06/01/2018	Week 4	28/01/2018	03/02/2018	Week 4	25/02/2018	03/03/2018

Period 13	Start	Finish
Week 1	04/03/2018	10/03/2018
Week 2	11/03/2018	17/03/2018
Week 3	18/03/2018	24/03/2018
Week 4	25/03/2018	31/03/2018



APPENDIX B

Vessel Traffic Survey for the Rotherhithe to Canary Wharf Bridge Project – Monthly Report 009 (January 2018) attached separately.



TRANSPORT FOR LONDON PLANNING

**VESSEL TRAFFIC SURVEY FOR THE ROTHERHITHE TO CANARY
WHARF BRIDGE PROJECT - MONTHLY REPORT 009 (JANUARY
2018)**



Report Number: 17UK1303_009
Issue: Issue 01
Date: 16 February 2018



MARINE AND RISK CONSULTANTS LTD

TRANSPORT FOR LONDON PLANNING

VESSEL TRAFFIC SURVEY FOR THE ROTHERHITHE TO CANARY WHARF BRIDGE PROJECT - MONTHLY REPORT 009 (JANUARY 2018)

Prepared for: Transport for London Planning
9th Floor, Windsor House
50 Victoria Street
London SW1H 0TL

Author(s):

Checked By:



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Marine and Risk Consultants Ltd
Marico Marine
Bramshaw
Lyndhurst
SO43 7JB
Hampshire
United Kingdom

Tel. + 44 (0) 2380 811133

16th February 2018

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1 INTRODUCTION

This monthly report has been prepared for Transport for London Planning (TfL) by Marine and Risk Consultants Limited (Marico Marine) and provides preliminary analysis of vessel traffic data collected during the Vessel Traffic Survey for the Rotherhithe to Canary Wharf Bridge Project.

This report covers the January 2018 period (period 009) between 00:00 on 01/01/18 to 23:59 on 31/01/18.

The objective of the survey is to provide TfL with comprehensive data on vessel movements passing through the site of the proposed bridge, including data on the air-draught of vessels in order to ascertain the potential implications on the bridge at different heights. It covers the area in the vicinity of the proposed bridge as shown in Figure 1.

This report does not contain any conclusions or recommendations as a final report with consolidated results and conclusions/recommendations will be provided at the end of the survey.

Annex A contains details of the specification and equipment used in this survey.

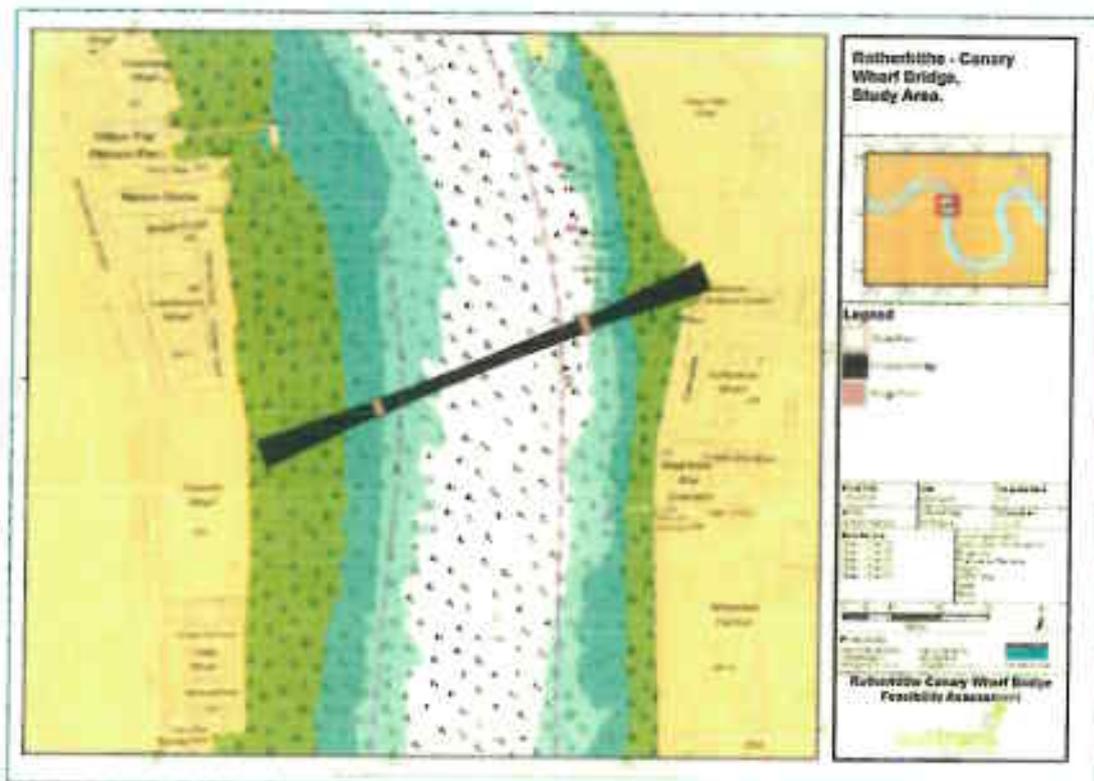


Figure 1: Rotherhithe - Canary Wharf Bridge Study Area.

2 SURVEY REPORT – JANUARY 2018

Survey Commenced: 5th May 2017

Reporting Period: 1st January 2018 to 31st January 2018.

Figure 2 shows the number of transits per day for those recorded by AIS or through the visual survey. 2.19% of vessels recorded did not have AIS. The total number of vessel transits through the area during the survey period was 6537, an average of 211 per day.

A technical fault occurred with the camera on the 24th January which took a week to rectify and install a replacement part. Therefore, after the 24th January no non-AIS vessels were detected.

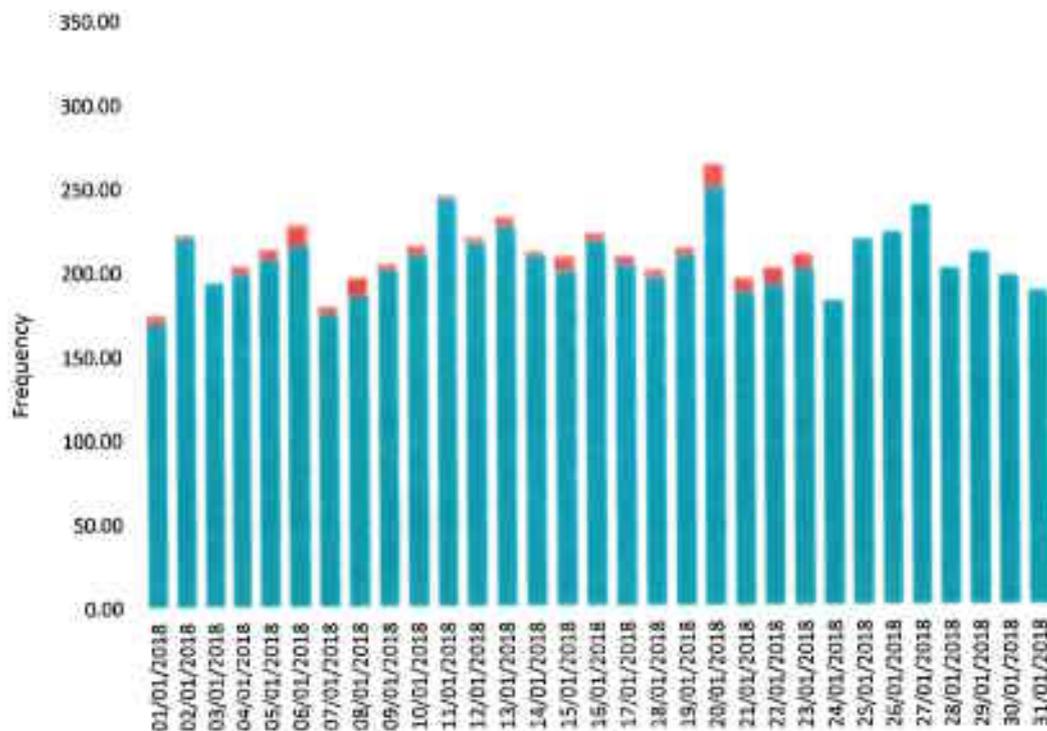


Figure 2: Transits per day (Y=AIS, N=Visual Only).

3 VESSEL TRAFFIC ANALYSIS

Details of the data collected during the reporting period (January 2018) are provided below. Where possible, graphs display the cumulative results for this month and all previous months of survey as a red line.

Figure 3 shows the transits by vessel category, with the majority being passenger vessels such as Thames Clippers, RIB Tours and Traditional Class 5, accounting for approximately 64% of all transits.

A table showing all the vessel types within each vessel category is provided in Annex A.

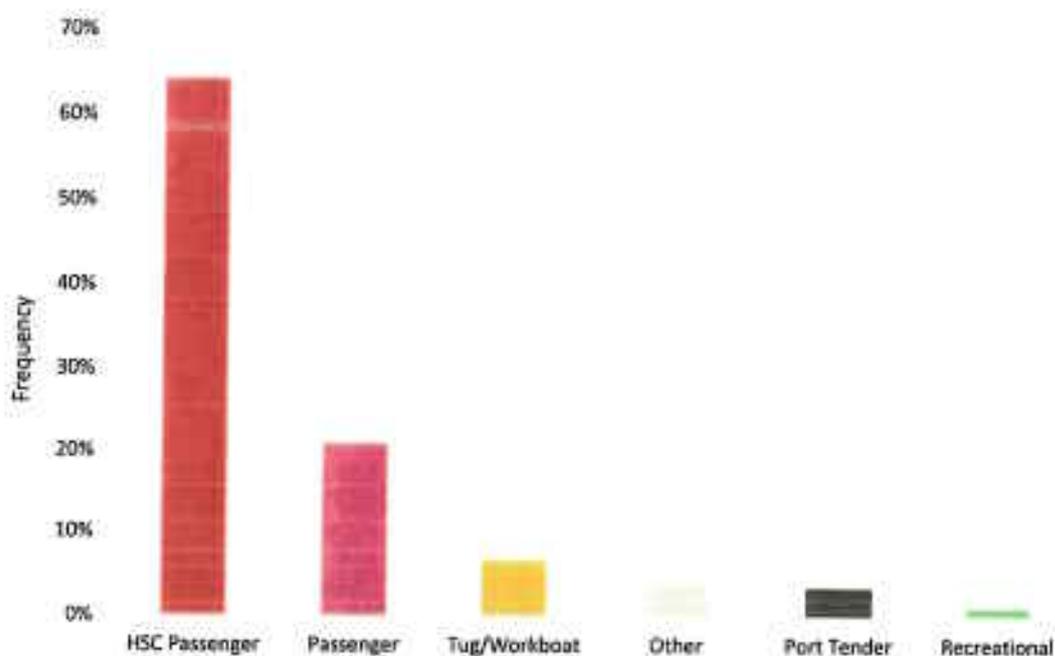


Figure 3: Transits by Vessel Category.

Figure 4 shows the distribution of transits by length of vessel (LOA), with most vessels between 35 and 40m. Figure 5 gives the distribution of transits by hour of transit. The peak hours of vessel traffic are between 1100 and 1500.

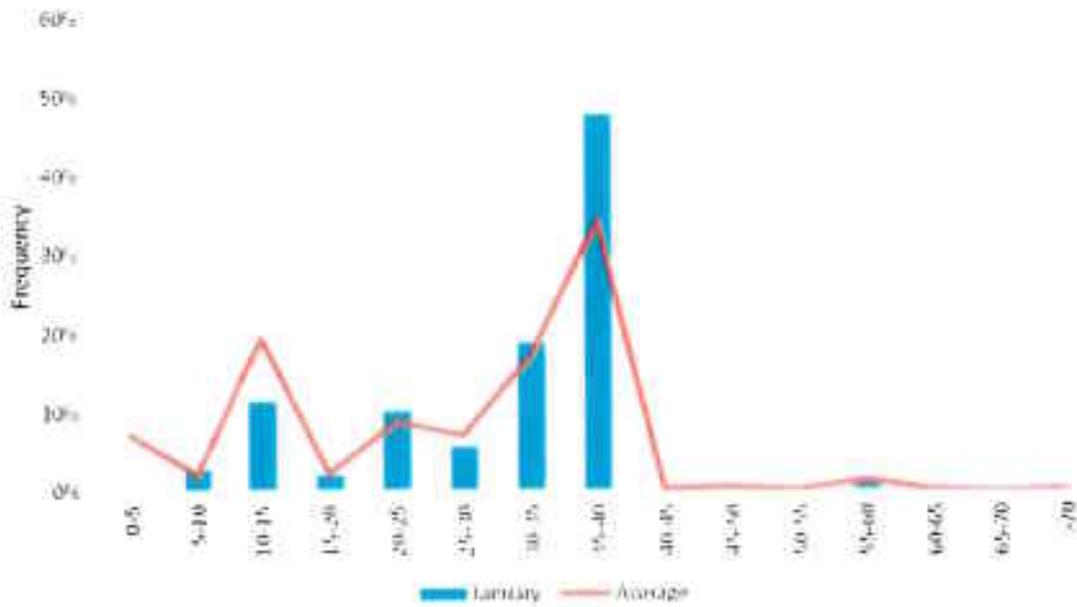


Figure 4: Transits by vessel length (metres).

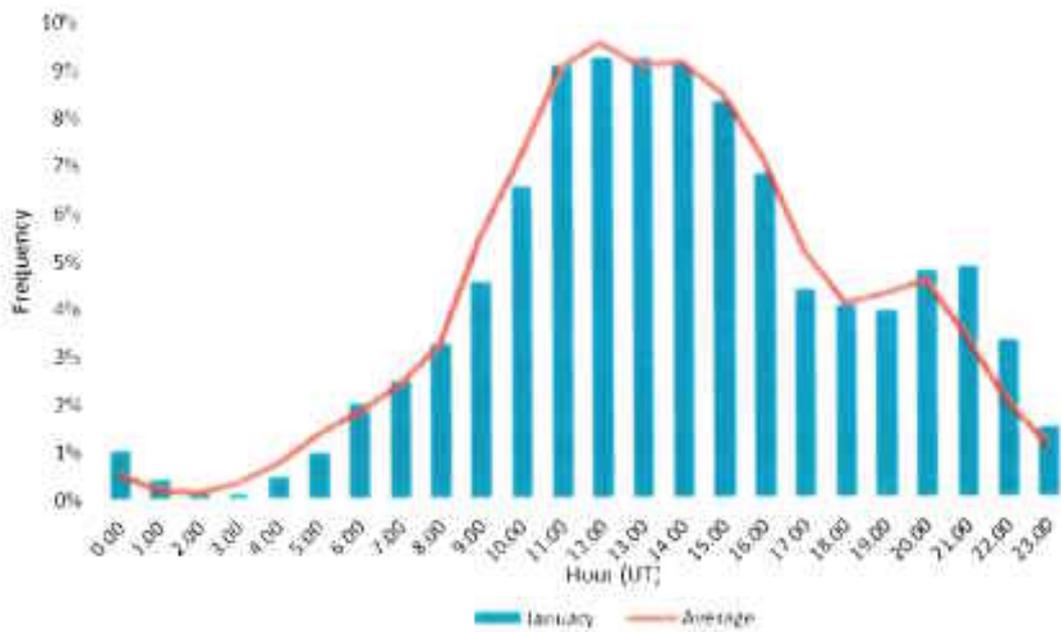


Figure 5: Distribution of vessel transit times (UT).

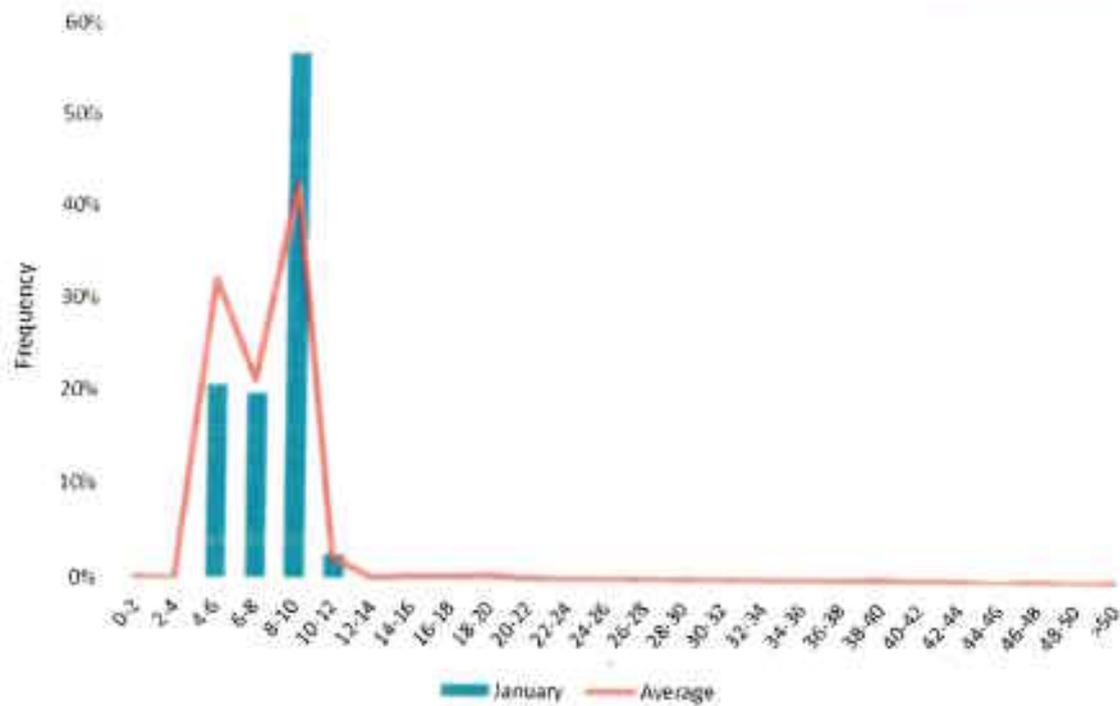


Figure 6: Distribution of Vessel Heights (metres).

Analysis was conducted on the air draught of vessel transits. Figure 7 shows a schematic of definitions of air draught that were analysed against different datums.

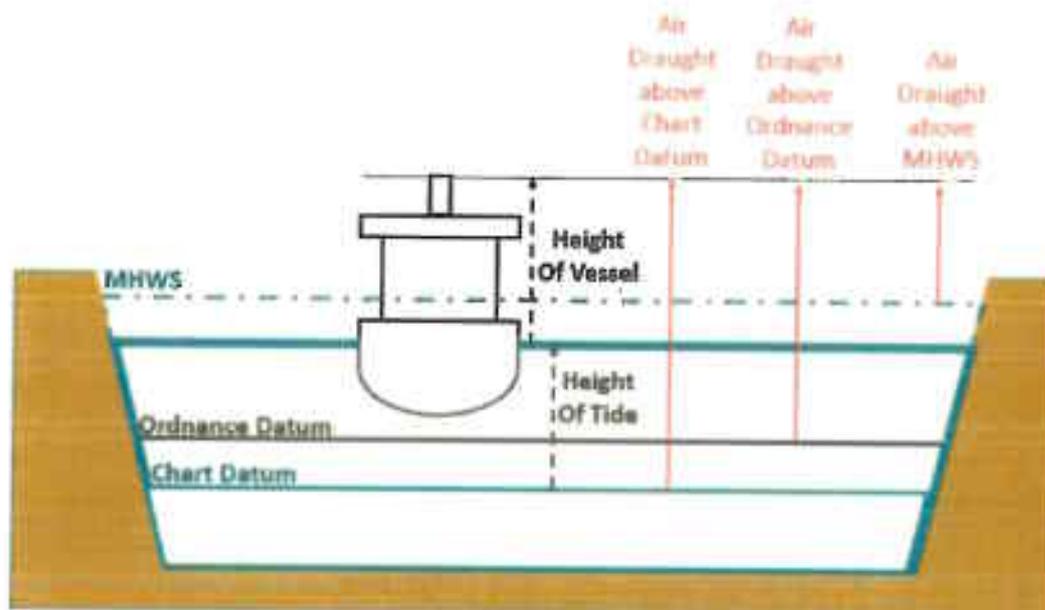


Figure 7: Schematic of Air Draught Definitions.

Figure 8 shows the air draught distribution of vessels, calculated by summing the estimated height of a vessel +10% margin of error and the height of tide above chart datum.

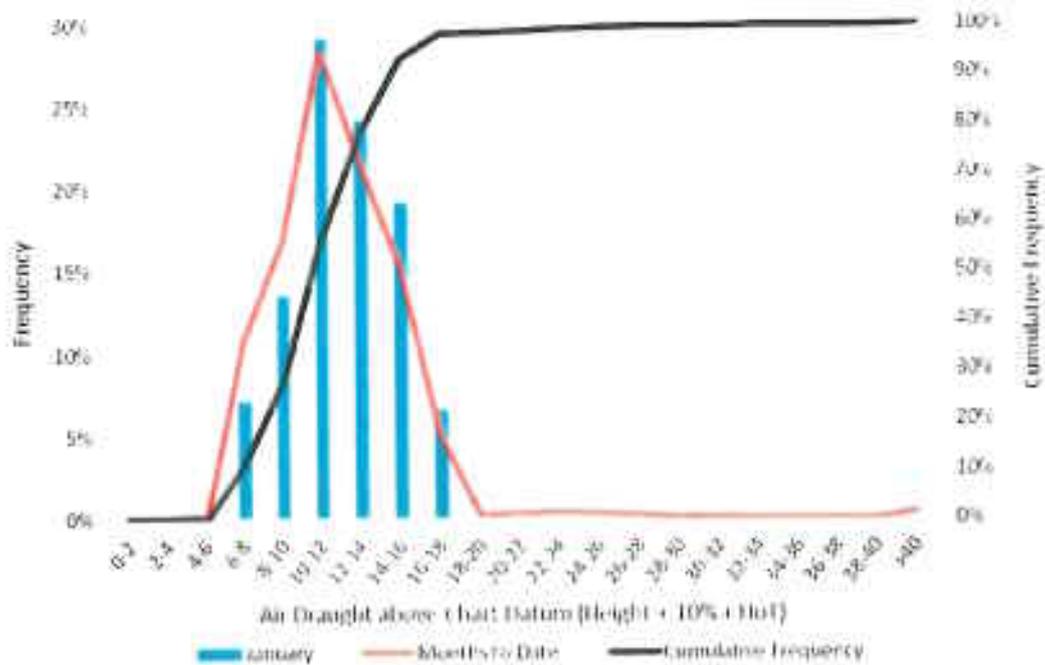


Figure 8: Distribution of air draughts (height of mast + height of tide + 10%).

Table 1, Table 2 and Table 3 provides a log of all transits per day at different air draughts against the definitions provided in Figure 7.

Table 1: Transits per day by air draught above chart datum – height of the vessel + 10% + height of tide above chart datum.

	0-2	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	26-28	28-30	Total
01/01/2018			2	13	45	38	48	28	1				175
02/01/2018			9	21	77	53	43	19		1			223
03/01/2018		1	2	27	59	48	33	24					194
04/01/2018		2	17	23	65	40	35	22					204
05/01/2018	1	2	16	29	62	52	34	18					214
06/01/2018		3	27	42	61	45	28	22		1			229
07/01/2018			17	30	49	37	29	18					180
08/01/2018			17	28	53	49	35	15					197
09/01/2018			14	37	60	39	39	15		1			205
10/01/2018			25	33	62	38	48	10					216
11/01/2018			18	31	83	51	62	1					246
12/01/2018			8	34	56	58	60	3		2			221
13/01/2018			16	34	76	53	44	10					233
14/01/2018			7	21	75	49	49	14					215
15/01/2018			1	26	62	58	46	14			2		209
16/01/2018			10	20	66	64	47	16					223
17/01/2018			13	21	65	58	38	14					209
18/01/2018			12	25	57	60	36	11					201
19/01/2018			14	28	66	54	40	12					214

	0-2	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	24-26	28-30	Total
20/01/2018			34	47	73	57	36	17					264
21/01/2018			23	20	64	38	37	14					196
22/01/2018			23	28	55	52	31	13					202
23/01/2018			18	34	60	54	34	10					210
24/01/2018			11	32	47	51	34	9					184
25/01/2018			20	34	64	51	41	9					219
26/01/2018	1		13	36	67	52	43	11					223
27/01/2018			41	36	53	60	45	4					239
28/01/2018			14	32	55	52	33	15					201
29/01/2018			5	25	69	53	47	12					211
30/01/2018			6	20	55	57	43	16					197
31/01/2018	2		10	19	46	57	36	17	1				188
Total	4	8	463	886	1907	1578	1254	433	2	3	2	2	6542

Table 2: Transits per day by air draught above MHWS of 7.1m (height of the vessel + 10% + height of tide above chart datum).

	<0	0-2	2-4	4-6	6-8	8-10	10-12	12-16	14-16	18-20	20-22	Total
01/01/2018		8	33	42	41	47	4					175
02/01/2018	2	12	59	73	44	25	7	1				223
03/01/2018	3	14	48	56	33	31	9					194
04/01/2018	10	21	47	56	36	28	6					204
05/01/2018	13	20	52	57	41	23	8					214
06/01/2018	20	31	59	52	34	25	7			1		229
07/01/2018	9	26	40	43	33	29						180
08/01/2018	9	21	43	57	36	31						197
09/01/2018	4	27	51	52	38	32				1		205
10/01/2018	13	31	44	54	43	31						216
11/01/2018	10	25	44	84	46	37						246
12/01/2018	6	17	40	66	56	34			1			221
13/01/2018	8	25	38	85	46	31						233
14/01/2018		12	45	74	50	32	2					215
15/01/2018		16	36	68	53	33	1				2	209
16/01/2018	3	15	45	78	52	29	1					223
17/01/2018	11	15	37	68	50	28						209
18/01/2018	7	17	40	67	45	25						201
19/01/2018	6	23	44	69	45	27						214

	-0	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-20	20-22	Total
20/01/2018	15	41	68	71	36	31	2					264
21/01/2018	12	22	41	55	36	30						196
22/01/2018	12	21	47	52	46	24						202
23/01/2018	9	24	42	70	40	25						210
24/01/2018	6	20	39	59	36	24						184
25/01/2018	5	31	43	68	48	24						219
26/01/2018	4	30	51	60	48	30						223
27/01/2018	23	40	36	63	52	25						239
28/01/2018	2	29	37	61	43	29						201
29/01/2018	2	11	52	65	50	30	1					211
30/01/2018	2	12	41	56	52	33	1					197
31/01/2018	3	16	41	51	45	27	5					188
Total	229	673	1383	1932	1354	910	54	2	1	2	2	6542

Table 3: Transits per day by air draught above Ordnance Datum (height of the vessel + 10% + height of tide above ordnance datum).

	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	22-24	24-26	Total
01/01/2018		1	7	40	38	43	43	3					175
02/01/2018		4	12	67	67	43	28	1	1				223
03/01/2018		3	17	54	51	36	31	2					194
04/01/2018		12	23	53	52	36	25	3					204
05/01/2018	1	15	22	56	55	40	24	1					214
06/01/2018		23	33	61	48	33	29	1			1		229
07/01/2018		13	27	43	39	32	26						180
08/01/2018		11	22	49	55	37	23						197
09/01/2018		7	30	56	47	37	27				1		205
10/01/2018		17	29	53	46	44	27						216
11/01/2018		12	30	51	76	46	31						246
12/01/2018		8	19	46	66	52	28		1	1			221
13/01/2018		9	29	52	72	45	26						233
14/01/2018		3	13	55	66	52	25	1					215
15/01/2018			20	45	66	48	28					2	209
16/01/2018		7	18	49	73	50	26						223
17/01/2018		11	16	49	65	44	24						209
18/01/2018		8	17	53	60	43	20						201
19/01/2018		7	25	49	73	37	23						214

	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	22-24	24-26	Total
20/01/2018		23	34	80	64	35	27	1					264
21/01/2018		16	23	48	46	37	26						196
22/01/2018		12	27	47	54	43	19						202
23/01/2018		12	25	53	62	41	17						210
24/01/2018		6	28	39	57	37	17						184
25/01/2018		12	28	49	66	46	18						219
26/01/2018	1	9	32	54	55	48	24						223
27/01/2018		32	39	41	58	52	17						239
28/01/2018		6	29	49	52	39	25						201
29/01/2018		3	16	59	60	49	24						211
30/01/2018		2	14	45	61	47	27	1					197
31/01/2018	2	6	13	45	52	42	25	2					188
Total	4	310	717	1590	1802	1314	782	16	2	1	2	2	6542

Annex A Survey Details

SURVEY EQUIPMENT

The survey equipment comprises an Automatic Identification System (AIS) receiver, a ruggedized CCTV camera, and ancillary equipment (including a PC). A Vodafone 3G data modem is used to transmit the AIS data and CCTV images to the Marico office in Southampton, where it is processed and archived.

The survey equipment is installed on the roof of the Doubletree by Hilton London Docklands Riverside Hotel, 265 Rotherhithe Street, London SE16 5HW, as shown in Figure 2.



Figure 9: Photographs of the Vessel Traffic Survey Equipment

AUTOMATIC IDENTIFICATION SYSTEM

The AIS System operates 24/7 and the data is stored on the Marico AIS server (in Southampton) as well as being backed-up on a local PC in case of a communications failure.

All vessels fitted with AIS transmit information about themselves (e.g. name, call sign), their physical characteristics (e.g. length/breadth/draught) and their navigational status (e.g. position, speed). All AIS information pertinent to this Vessel Traffic Survey is tabulated and presented herein at Annex A.

Note that AIS does not provide the air-draught of vessels.

CCTV CAMERA SYSTEM

The CCTV system also operates 24/7 however it is a daylight optical camera so provides reliable CCTV images only during the hours of sunrise to sunset.

As it is impractical to stream live CCTV video images over the 3G network due to the high volume of data, the CCTV camera automatically takes a photograph when a vessel enters the area, which is emailed to Marico. As a back-up, the system also records CCTV images at 1 frame every 5 seconds

and these are stored on the local PC so it can be retrieved if required, i.e. if there is a communications failure.

All CCTV photographs are recorded and reviewed by a Marico Analyst as follows:

- If there is AIS data from the vessel then most of the required information is automatically captured and forwarded to the AIS server for processing, however our analyst will assess the photograph in order to estimate the air-draught of the vessel;
- If there is no AIS data from the vessel (i.e. the vessel does not have an AIS transponder), then our analyst will assess the photograph in order to determine:
 - Date and Time (automatically stamped onto each photograph);
 - Vessel type/category; and
 - Air-draught.

Figure 3 is an example photograph that was taken by the CCTV System on 05/05/17 at 14:14.



Figure 10: Example Photographs from the CCTV Camera

VESSEL TRAFFIC DATA

The key data required for the analysis is:

- Date and Time that the vessel passed through the area;
- Vessel type/category;
- Vessel air-draught;

- Height of Tide;

VESSEL TYPES/CATEGORIES

Vessels were grouped into generic categories for the data analysis, as shown in Table 4.

Table 4: Vessel Categories.

Vessel Categories	Examples of Vessel Types
HSC Passenger	Clippers RIB Tours
Passenger	Traditional Class 5 Cruise Ship Large Commercial Yacht (Sailing Barge etc.)
Port Tender	Port Tender (PLA Launch etc.)
Recreational	Pleasure Craft (Powered) RIB Yacht Canoe/Kayak/Rower House Boat RIB /HSC Stand Up Paddle Board
Tug/Workboat	Tug GPS Marine Cory Environmental Workboat Crane Barge Workboat
Other	Cargo vessel Law enforcement vessel Search and rescue vessel Tanker Fire Fighting Unknown

The majority of commercial passenger vessels that operate on this stretch of the River Thames are categorised as "Class 5 Passenger Vessels" as defined by the Merchant Shipping (Safety of Navigation) Regulations 2002. For the purposes of this study these vessels have been further sub-categorised as either "HSC & Manoeuvrable Class 5" or "Traditional Class 5". This maintains consistency with the vessel categories used by the PLA in their Navigational Risk Assessments, and it recognises that older Class 5 Passenger Vessels are generally less manoeuvrable than modern Class 5 Passenger Vessels, and therefore potentially represent a higher risk of collisions, contacts and/or impacts with bridge structures.

TIDE HEIGHT AND HIGH-WATER TIMES

The tide height and high-water times for the area have been extracted from the PLA database for the corresponding period. The data is available at one-minute interval for London Bridge from: <http://tidepredictions.pla.co.uk/>. These heights have been matched to the transit time of the recorded vessels to provide accurate measurements of height.

Table 5: Tide height and high-water Times

Tidal Station: London Bridge (Tower Pier)	Chart Datum (m)
Highest Astronomical Tide (HAT)	7.7
Mean High Water Springs (MHWS)	7.1
Mean High Water Neaps (MHWN)	5.9
Ordinance Datum	3.35
Mean Low Water Neaps (MLWN)	1.3
Mean Low Water Springs (MLWS)	0.5
Lowest Astronomical tide (LAT) /Chart Datum	-0.2

AIR-DRAUGHT

Air-draught is the distance from the surface of the water to the highest point on a vessel and "clearance" is the distance in excess of the air-draught which is required in order for the vessel to pass safely under a bridge or obstacle such as power lines, etc. The PLA requires vessels to have a minimum clearance of 0.75m on an ebb (outgoing) tide and 1.00m on a flood (incoming) tide.

Given the uncertainties of estimating the height of a vessel, a 10% margin of error has been built into the air draught calculations.

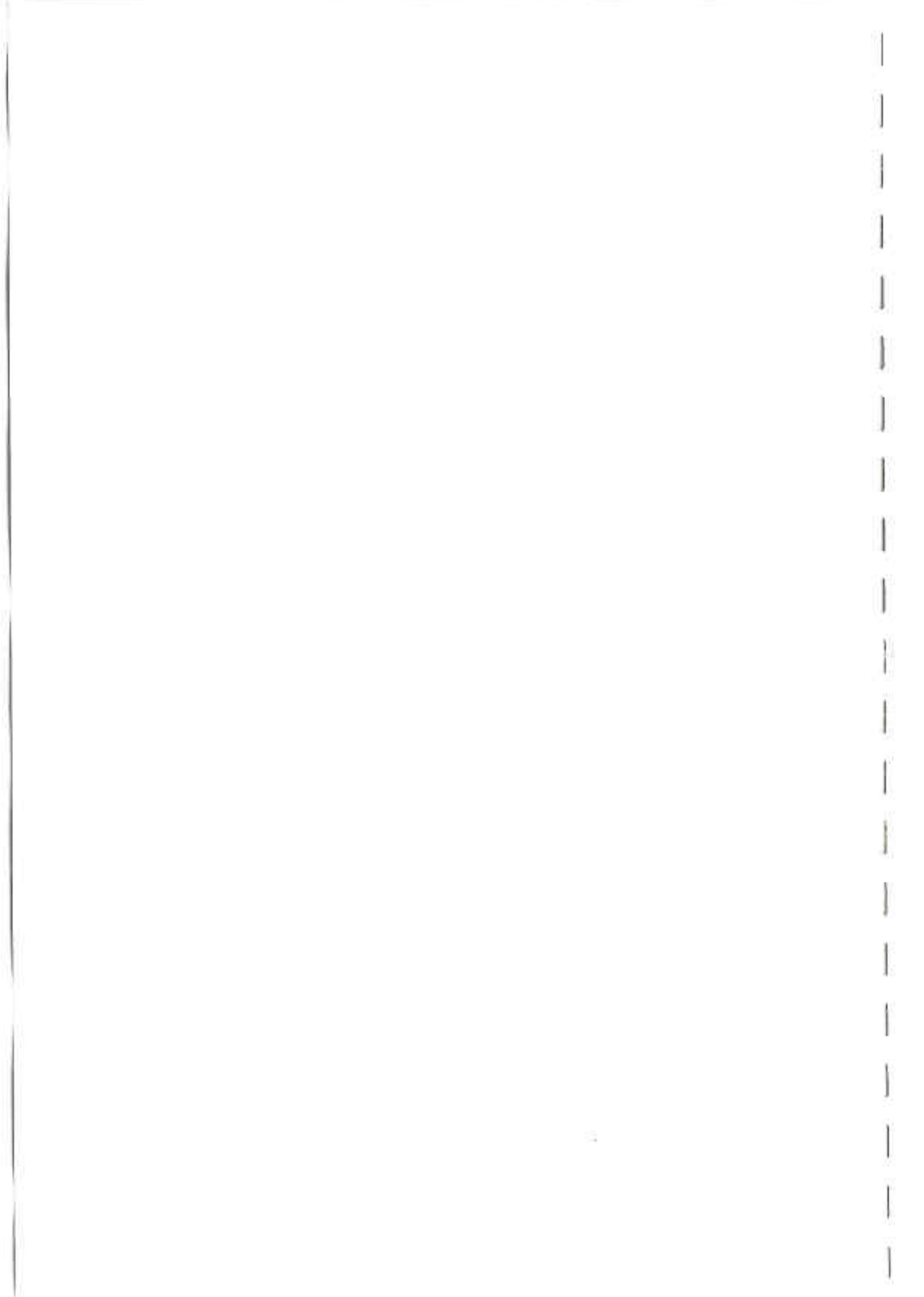
DATA COLLATION

An excel spreadsheet was created that collated the information collected for each transit, both from AIS and visual, and was used as the basis of the data analysis. This sheet was completed manually and cross checked between the pictures and the AIS data. This sheet includes:

- Transit date and time;
- Name and characteristics of the vessel;
- Length and height estimates;
- Height of tide for that time;
- Air draught (height of vessel + height of tide + 10%).

An extract of this sheet is given below:

ID	AVT	Date	Time	MMSI	Name	Type	Class	Length	Beam	Depth	Speed	Course	Alt
2906	Y	16/05/2017	05:26:05	235056887	AURORA CLIPPER	Clippers	HSC Passenger	38.00	9.00	6.40	6.40	16.30	
2907	Y	16/05/2017	05:26:33	235112741	GALAXY CLIPPER	Clippers	HSC Passenger	32.00	8.00	6.40	6.40	15.20	
2908	Y	16/05/2017	05:36:20	235053695	GFS ANGELA	GFS	Tug/Workboat	29.00	5.00	6.50	6.50	12.00	
2909	N	16/05/2017	05:40:08			Yacht	Recreational	12.80	19.20	6.50	6.50	27.62	
2910	N	16/05/2017	05:42:04			Yacht	Recreational	9.14	13.72	6.50	6.50	21.59	
2911	N	16/05/2017	05:42:48			Yacht	Recreational	12.80	19.20	6.50	6.50	27.62	
2912	N	16/05/2017	05:42:48			Yacht	Recreational	12.19	18.29	6.50	6.50	26.62	
2913	N	16/05/2017	05:43:21			Yacht	Recreational	10.36	15.54	6.50	6.50	23.60	
2914	Y	16/05/2017	05:43:28	239002979	MYLOR MIST	Yacht	Recreational	10.00	15.00	6.50	6.50	23.00	
2915	Y	16/05/2017	05:46:19	239053178	TWIN STAR	Traditional Class 5	Passenger	31.00	6.00	6.50	6.50	13.10	
2916	Y	16/05/2017	05:46:38	239053178	TWIN STAR	Traditional Class 5	Passenger	31.00	6.00	6.50	6.50	13.10	
2917	N	16/05/2017	05:53:58			Yacht	Recreational	10.36	15.54	6.50	6.50	23.60	
2918	Y	16/05/2017	05:55:38	235056888	TYPHOON CLIPPER	Clippers	HSC Passenger	38.00	9.00	6.50	6.50	16.40	
2919	Y	16/05/2017	06:09:33	244620729	GFS IBERIA	GFS	Tug/Workboat	23.00	5.00	6.30	6.30	11.80	
2920	Y	16/05/2017	06:16:11	235056993	CYCLONE CLIPPER	Clippers	HSC Passenger	38.00	9.00	6.30	6.30	16.20	
2921	Y	16/05/2017	06:21:20	235078456	ARCADIUS	Yacht	Recreational	12.00	18.00	6.20	6.20	26.00	
2922	Y	16/05/2017	06:27:30	235105516	ROCKET JUNIOR	RIB Tours	HSC Passenger	10.00	5.00	6.10	6.10	11.60	
2923	Y	16/05/2017	06:27:32	235113139	BUILDING	Tug	Tug/Workboat	15.00	5.00	6.10	6.10	11.60	
2924	Y	16/05/2017	06:36:28	235053178	TWIN STAR	Traditional Class 5	Passenger	31.00	6.00	6.00	6.00	12.60	
2925	Y	16/05/2017	06:37:25	235057011	MONSOON CLIPPER	Clippers	HSC Passenger	38.00	9.00	6.00	6.00	15.90	
2926	Y	16/05/2017	06:38:44	235056987	AURORA CLIPPER	Clippers	HSC Passenger	38.00	9.00	5.90	5.90	15.80	
2927	Y	16/05/2017	06:39:09	235053178	TWIN STAR	Traditional Class 5	Passenger	31.00	6.00	5.90	5.90	12.50	
2928	Y	16/05/2017	06:56:14	235053188	HURRICANE CLIPPER	Clippers	HSC Passenger	38.00	9.00	5.60	5.60	15.50	
2929	N	16/05/2017	07:05:58			RIB	Recreational	5.00	5.00	5.40	5.40	10.90	
2930	Y	16/05/2017	07:08:09	235056986	TYPHOON CLIPPER	Clippers	HSC Passenger	36.00	9.00	5.30	5.30	15.20	





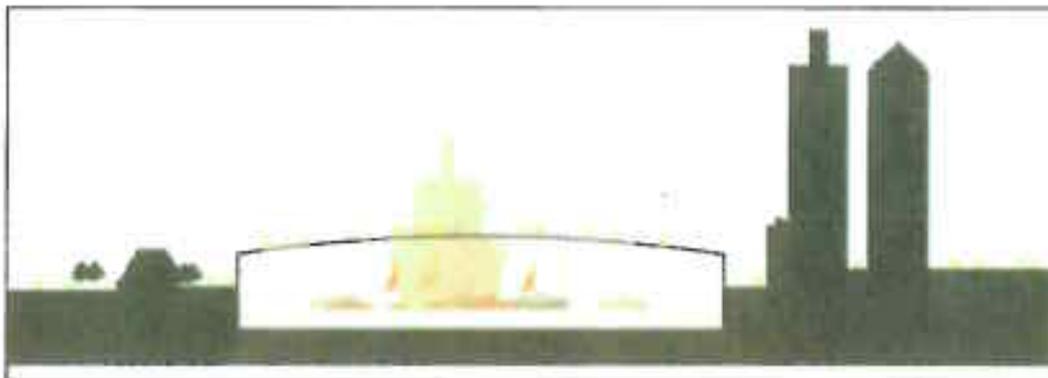
APPENDIX C

Rotherhithe to Canary Wharf Bridge: Preliminary Navigation Risk Assessment attached separately.



TRANSPORT FOR LONDON

**ROTHERHITHE TO CANARY WHARF BRIDGE: PRELIMINARY
NAVIGATION RISK ASSESSMENT**



Report Number: 17UK1303
Issue: Draft B
Date: 13 December 2017



MARINE AND RISK CONSULTANTS LTD

TRANSPORT FOR LONDON

ROTHERHITHE TO CANARY WHARF BRIDGE: PRELIMINARY NAVIGATION RISK ASSESSMENT

Prepared for: Transport for London
230 Blackfriars Road
London
SE1 8PJ

Author(s):

[Redacted]

Checked By:

Dr [Redacted]

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Marine and Risk Consultants Ltd
Marico Marine
Bramshaw
Lyndhurst
SO43 7JB
Hampshire
United Kingdom

Tel. + 44 (0) 2380 811133

13 December 2017

EXECUTIVE SUMMARY

This report presents the findings of a high-level Preliminary Navigation Risk Assessment for the proposed Rotherhithe to Canary Wharf foot and bicycle bridge over the River Thames in London, UK. Transport for London (TfL) are currently working with Arcadis and Knight Architects to develop options for the bridge location and characteristics to meet the requirement of the Port of London Authority who are the responsible authority for the preservation of navigation safety on the River Thames.

Three bridge locations were identified for review during the Preliminary Navigation Risk Assessment, each having a different central opening span width, although detailed designs are not yet available for any of the locations:

- North - 159m Span;
- North - 127m Span; and
- South – 120m Span.

The preliminary assessment considered the current traffic conditions as recorded on the River Thames at the proposed crossing location, and used this data, along with recorded incident data, stakeholder consultation with the PLA Harbour Master (Upper) and professional judgement, to assess how each proposed bridge location would impact navigational safety for those vessels navigating the River.

The results of the assessment identified two high risk hazard scenarios: "*Collision as a result of Bridge - < 15m Air Draught - Class 5/HSC/RIBs ICW Other Vessel*" for both northern bridge options with no additional risk controls in place. These high risk hazards can be directly attributed to the close proximity of the existing intensively used Canary Wharf Pier to the east of the proposed piers of both northern bridge options. All other hazard scenarios for all three design options were assessed to be either moderate or minor risk without additional risk control measures.

Following assessment of additional risk controls, it was demonstrated that navigation risk could be reduced in all scenarios to moderate or minor (below the ALARP range).

The risk assessment process demonstrated that:

- Without mitigation: Option North 127m presented the highest potential risk to navigational safety, while the Southern option presented the lowest risk, though differences were small;
- It was possible to mitigate the risk for all options, with the greatest potential risk reduction being achieved for North 127m; and
- Following risk mitigation, the location presenting the lowest residual risk score remained the Southern option.

This preliminary Navigation Risk Assessment has demonstrated that it may be feasible to construct a bridge at any of the three locations identified, with the southern location being favoured in terms of navigational safety (only).

Before the design is finalised it is recommended that:

- Risk assessment be repeated once bridge designs and locations, and construction methodology are more detailed;
- The detailed design pays particular attention to:
 - Relocating eastern bridge pier further from authorised channel;
 - Relocating western bridge pier further from authorised channel;
 - Deconflicting bridge structure from Canary Wharf Pier (move pontoon, or move bridge pier "in line" with pontoon) in the case of a northern option.
 - Clear marking and lighting of bridge arch/piers;
 - Increase span height;
 - Impact protection; and
 - Procedures developed for the proposed bridge be based closely on current bridges, and be considered in a full NRA before construction;
- Simulation studies are conducted for large commercial vessels passing through the proposed bridge structure with span open; and
- Simulation studies are conducted to test abort procedures developed for both in and outbound commercial vessels.

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ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
CCTV	Closed Circuit Television
CHA	Competent Harbour Authority
D&B	Design and Build
HSC	High Speed Craft
HW	High Water
ICW	In Collision With
IMO	International Maritime Organisation
kt	knot (unit of speed equal to nautical mile per hour, approximately 1.15 mph)
LKE	Local Knowledge Endorsement
LOA	Length Over-All
LW	Low Water
m	metre
Marico Marine	Marine and Risk Consultants Ltd
MCA	Maritime and Coast Guard Agency
nm	Nautical Mile
NRA	Navigation Risk Assessment
PEC	Pilotage Exemption Certificate
PLA	Port of London Authority
Pre. NRA	Preliminary Navigation Risk Assessment
PWC	Personal Water Craft
RIB	Ridged Inflatable Boat
SHA	Statutory Harbour Authority
SMS	Safety Management System
STCW	Standards of Training Certification and Watchkeeping
TfL	Transport for London
VHF	Very High Frequency (radio communication)
VTS	Vessel Traffic Service

1 INTRODUCTION

1.1.1.1 This report presents the findings of a high-level Preliminary Navigation Risk Assessment (Pre.NRA) for the proposed Rotherhithe to Canary Wharf foot and bicycle bridge over the River Thames in London, UK. Transport for London (TfL) are currently working with Arcadis and Knight Architects to develop options for bridge location and characteristics to meet the requirements of the Port of London Authority (PLA) who are the responsible authority for the preservation of navigation safety on the River Thames.

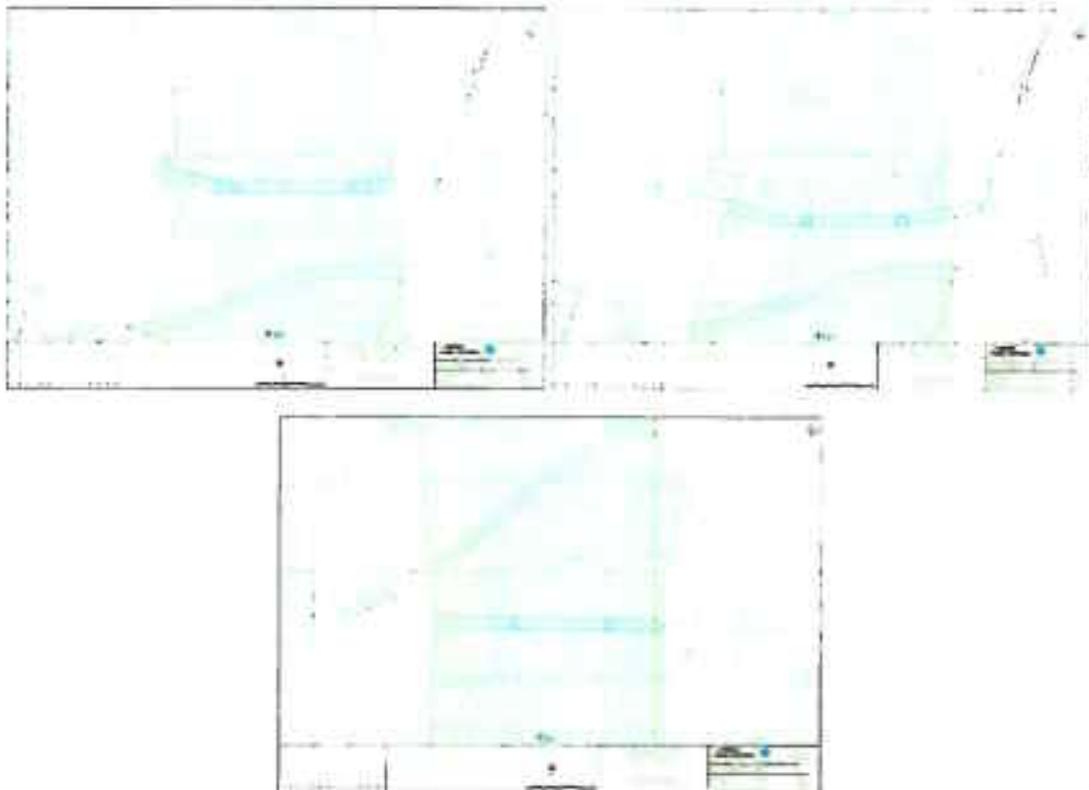


Figure 1: Plot showing three bridge span and pier locations.

1.1.1.2 Three bridge locations were identified, a North option, a Central option and a Southern option, each having a different range of possible spans and navigational influences. The North option is on a bend in the river (see Figure 1 and Annex A for drawings), and the southern option on a straight reach. The central option has characteristics of both the Northern and Southern Options. Discussions between TfL, Arcadia and Marico Marine indicated that concentration on the Northern and Southern options would be the most efficient way to carry out the preliminary NRA. Two span variations were identified at the North: a 127m clear span with piers adjacent to the authorised channel, and a 159m clear span with additional clearance to the west side, this later variation reflecting the preliminary design proposal. A single variation was considered at the south, a 120m clear span with piers on the authorised channel

boundaries. The Southern option was designed to consider a likely minimum navigation width, but not representing the preliminary design proposal which is outside the authorised channel.

1.1.1.3 The actual design of the bridge is not yet specified, although the bridge will have to open to allow the passage of large vessels on the River Thames. As such the bridge could be a bascule bridge, a lifting bridge or a swing bridge type design. In order to facilitate the assessment of risk related to contact with the bridge span, preliminary bridge span heights were provided (see Figure 2).

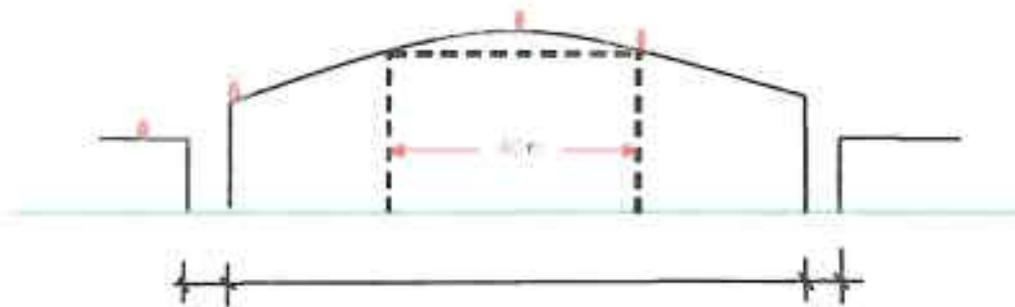


Figure 2: Bridge Air Draught – applicable to three bridge scenarios.

1.1.1.4 The Pre.NRA process was as follows:

1. Review bridge designs – Report Section 1;
2. Collect and analyse baseline vessel traffic data– Report Section 2;
3. Consultation with key regulator stakeholders– Report Section 3;
4. Navigation Risk Assessment – hazard identification, risk scoring and identification of necessary risk control measures– Report Sections 4 & 5; and
5. Study conclusions and recommendations – Report Section 6.

2 NAVIGATION: BASELINE TRAFFIC DATA

2.1 INTRODUCTION

2.1.1.1 This section of the report describes the activities that currently take place in Limehouse Reach in the Upper Thames and how the bridge may interact with them.

2.2 MANAGEMENT AND REGULATIONS

2.2.1.1 The PLA manages safety on 95 miles of the tidal Thames (including the area around the proposed bridge) as the Statutory Harbour Authority (SHA) and Competent Harbour Authority (CHA), through the Port of London Act. The PLA has a comprehensive and mature set of regulations covering all aspects of navigation on the Thames, including:

- Port of London River Byelaws;
- General Directions;
- Pilotage Directions;
- Permanent Notice to Mariners; and
- Various codes of practice (e.g. Towing on the Tidal Thames).

2.2.1.2 The PLA Pilotage Directions describe the requirements for vessels navigating on the Thames. In general, to the west of Margaret Ness, vessels over 40m LOA are required to take a pilot or hold a valid Pilot Exemption Certification (PEC) (PLA Pilotage Directions 2017). Local commercial intra-port vessels are subject to separate regulations based on the Marine and Coastguard Agency (MCA) Boatmaster's legislation (Merchant Shipping Regulations 2006). Where appropriate, skippers are required to have a Thames Local Knowledge Endorsement (LKE).

2.2.1.3 This section of the River Thames has a 30-knot speed limit for vessels with a Certificate of Compliance (Thames Byelaws 16).

2.2.1.4 The PLA provides Vessel Traffic Services (VTS) coverage throughout the port limits, with centres at Woolwich and Gravesend.

2.2.1.5 An Authorised Channel exists through much of the Thames which is marked on charts and within which the majority of large vessels navigate. The General Directions in the Port of London Act state that *"Except in an emergency or for the purposes of overtaking, or with the permission of the Harbourmaster, or when manoeuvring to or from piers, wharves, anchorages or other berths, all Reporting Vessels and vessels of 13.7 metres or more in Length Overall shall normally navigate only in the authorised channel as identified on PLA charts, and as required by Rule 9 of the International Collision Regulations. (3) Where there is sufficient room, vessels*

less than 13.7 metres in Length Overall should normally navigate outside the authorised channel unless constrained by their draught or otherwise restricted in ability to manoeuvre, or in an emergency."

2.2.1.6 Finally, the PLA Byelaws define some vessels as "Reporting Vessels" which are required to report their position, intentions or movements. Namely, vessels over 40m LOA, vessels of a gross tonnage in excess of 50 tons and tugs engaged in towing.

2.3 OVERVIEW OF VESSEL TRAFFIC

2.3.1.1 Analysis of Automatic Identification System (AIS) data has been undertaken in order to better understand vessel activity, particularly, the type and frequency of movements of vessels that passed the site. On the River Thames, AIS is mandated under PLA Byelaw 12 for most large vessels and passenger vessels and is carried on a voluntary basis by smaller craft, predominantly recreational vessels.

2.3.1.2 148 days of AIS data was analysed for between (5th May to 30th September 2017). Vessels were categorised according to air draught and vessel type into the following categories:

- >15m Air Draught Commercial Vessels;
- >15m Air Draught Recreational Vessels;
- <15m Air Draught Class5/ HSC/ RIBs;
- <15m Air Draught Intra Port Trade, Freight and Workboats; and
- <15m Recreational.

2.3.1.3 Each of these categories is considered in turn below and, where applicable, and where height was a key factor, they have been sub-categorised for further analysis.

2.4 LARGE COMMERCIAL VESSELS (>15M AIR DRAUGHT)

2.4.1.1 The transits of large commercial vessels with an air draught greater than 15m are represented within Figure 3. Large commercial vessels predominantly remain within the authorised

channel, particularly to the east where existing piers, such as Canary Wharf Pier, limit the available channel width.

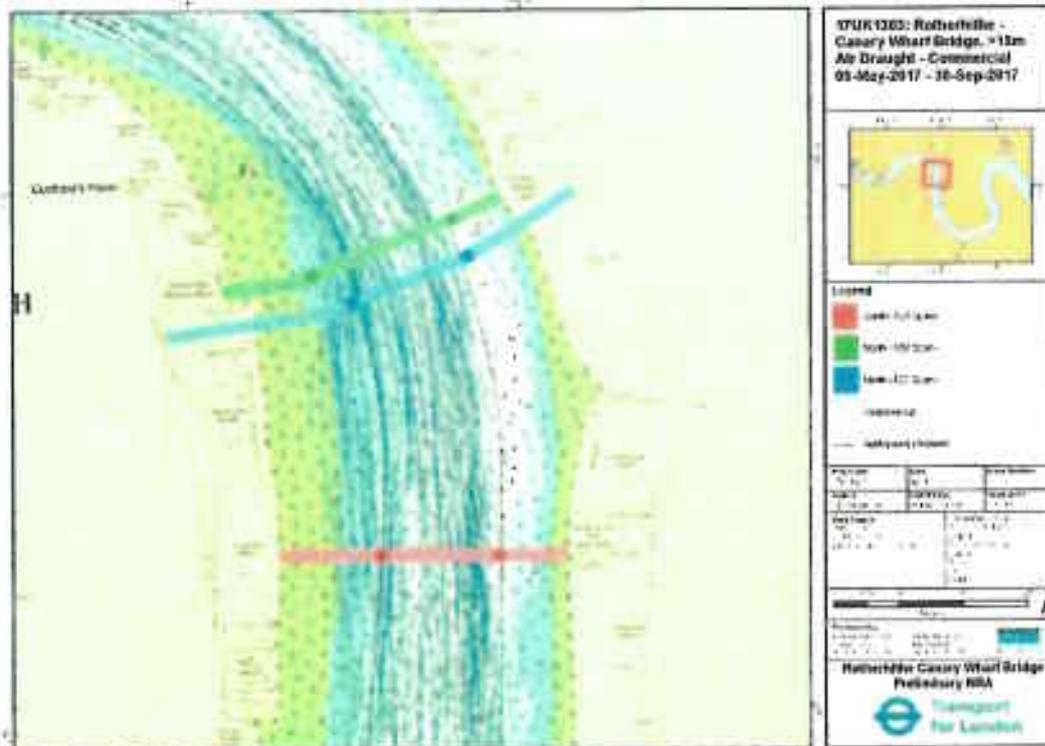


Figure 3: Large Commercial Vessels >15m Air Draught - 05 May 2017 30 September 2017.

2.4.1.2

2.4.1.3 Swept path analysis of cruise ship transits has been undertaken and is represented within Figure 4. Swept path analysis accounts for the beam of the vessel and subsequently allows for an accurate assessment of the true channel width that is occupied.

2.4.1.4 Within the assessed data period, there were 8 calls by cruise ships. With the exception of a minor deviation on the outbound side of the channel on the bend past Cuckolds Point, the

cruise ships remain within the authorised channel. It is noted that the cruise ships are not tug assisted within this section of the river.

2.4.1.5 Swept Path density analysis was undertaken to identify the distribution of cruise ship swept paths across the authorised channel (see Figure 5).

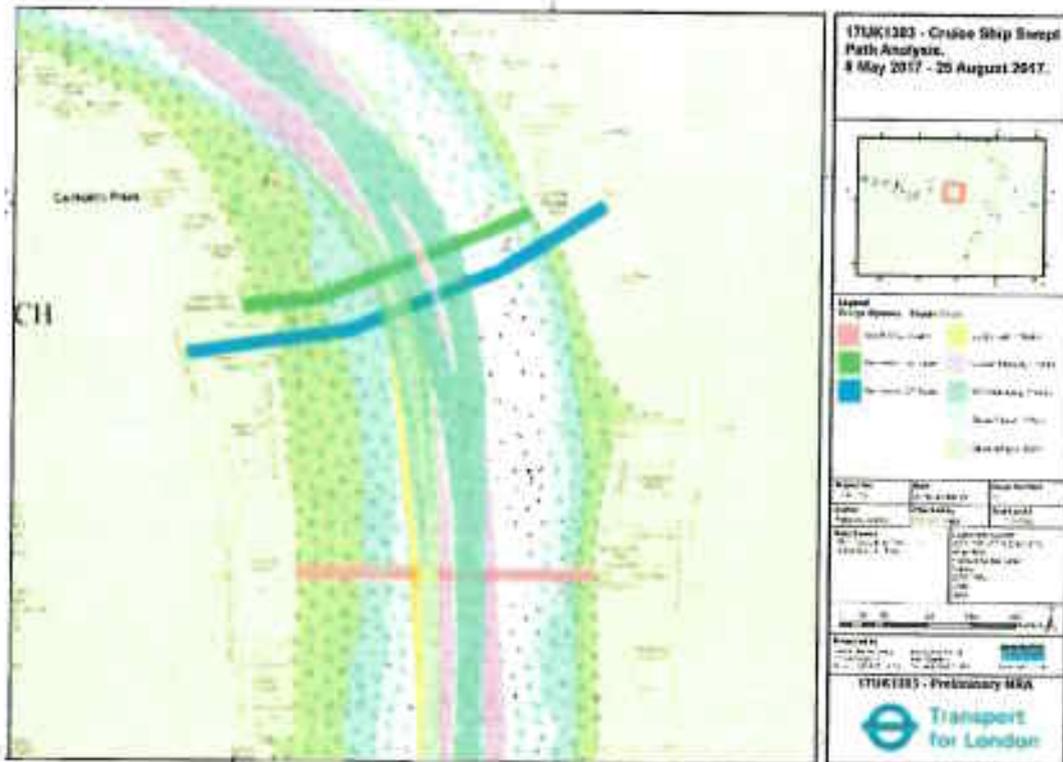


Figure 4: Cruise Ships Swept Path - 05 May 2017 30 September 2017.

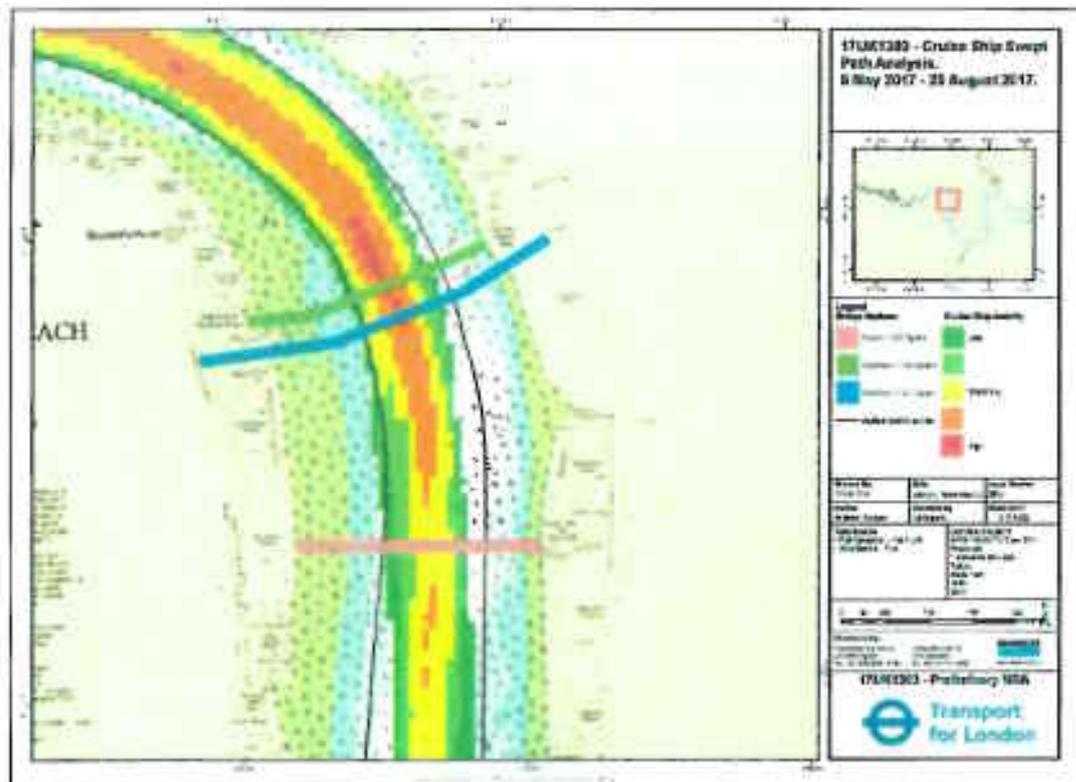


Figure 5: Cruise Ships Swept Path Density

2.5 PASSENGER VESSELS (<15M AIR DRAUGHT)

2.5.1.1 Figure 6 illustrates the transits of <15m air draught passenger vessels (including Traditional Class 5's, clippers and RIBs) within the study area over the representative data period. There were 32,465 transits by passenger vessels during the duration of the data period equating to an average of 219 transits per day. This is driven by Thames Clipper vessels which account for approximately 66% of all passenger vessel transits. Unlike cruise ships, the passenger vessel tracks are not confined to the authorised channel.

2.5.1.2 Passenger vessels, (predominantly Thames Clippers and 'Canary Wharf 4') are seen calling at Canary Wharf Pier, and therefore, there is an increased risk of manoeuvring passenger vessels

contacting the eastern bridge piers of the northern bridge options. The tracks furthest to the west of the authorised channel are predominantly RIB's.



Figure 6: <15m Air Draught - Class 5/HSC/RIBs - 05 May 2017 30 September 2017.

2.6 FREIGHT OPERATIONS & WORK BOATS (<15M AIR DRAUGHT)

2.6.1.1 Freight and workboat tracks are shown in Figure 7. Freight and workboats utilise a large portion of the channel width including outside the authorised channel, particularly to the

west. Freight predominantly transit through this portion of the Limehouse Reach and, therefore, the risk of a manoeuvring freight vessel contacting a bridge pier is low.

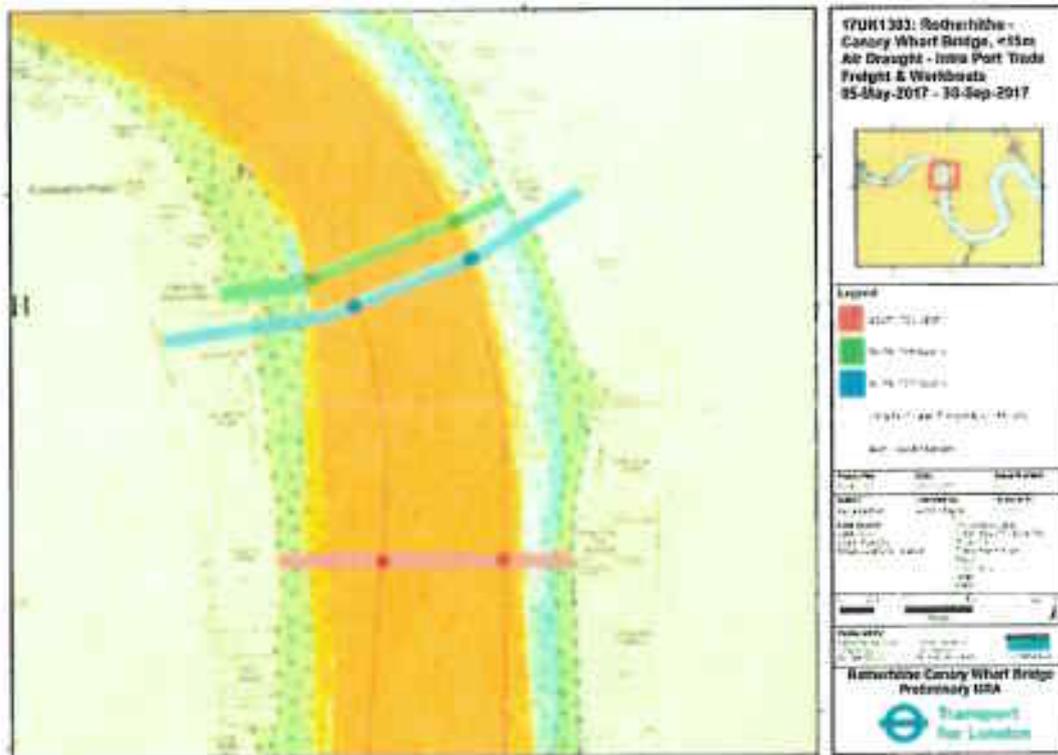


Figure 7: Intra-Port Freight and Workboats - 05 May 2017 30 September 2017.

2.7 RECREATIONAL VESSELS (ALL AIR DRAUGHTS)

2.7.1.1 Unlike deep-draught vessels, smaller vessels predominantly utilise the river outside of the authorised channel in order to keep clear of the main vessel routes and are therefore, more reliant on the availability of an inshore route. Recreational users are also more susceptible to wash from passing vessels which is disruptive and potentially hazardous as it can lead to capsize or swamping and being washed onto nearby structures. Figure 8 shows the location of key recreational bases near to the proposed bridge locations.

2.7.1.2 The majority of small recreational vessels do not carry AIS and the analysis is, therefore, focused on larger powered recreational vessels and yachts. Recreational vessels have been sub-divided according to air draught into the following categories:

- >15m air draught recreational; and
- <15m air draught recreational



Figure 8: Recreational sites near Canary Wharf (Source: PLA Leisure Guide).

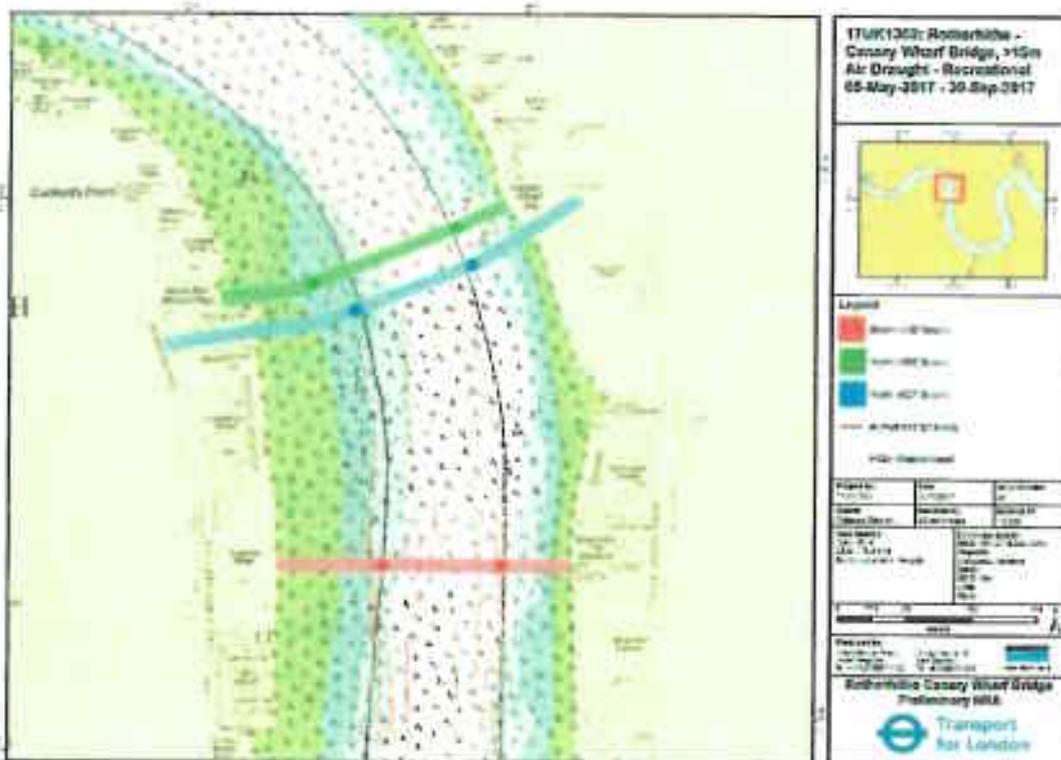


Figure 9: >15m Air Draught Recreational - 05 May 2017 to 30 September 2017.

2.7.1.3 Transits by recreational vessels with an air draught of >15m are shown in Figure 9. While these vessels are constrained to the authorised channel to the east owing to the presence of existing structures such as Canary Wharf Pier, they are seen transiting outside of the authorised channel to the west. In total 29 >15m recreational vessels transited through the

relatively even distribution and predominantly within the confines of the authorised channel, in the southern gate the inbound and outbound 'lanes' are less uniform, with the authorised channel primarily utilised by inbound vessels. Outbound vessels within the southern gate are, therefore, utilising a much larger area outwith of the authorised channel and within close proximity to the western pier location of the southern bridge option. This indicates that the availability of an inshore passage may be important, particularly to smaller vessels at this location.

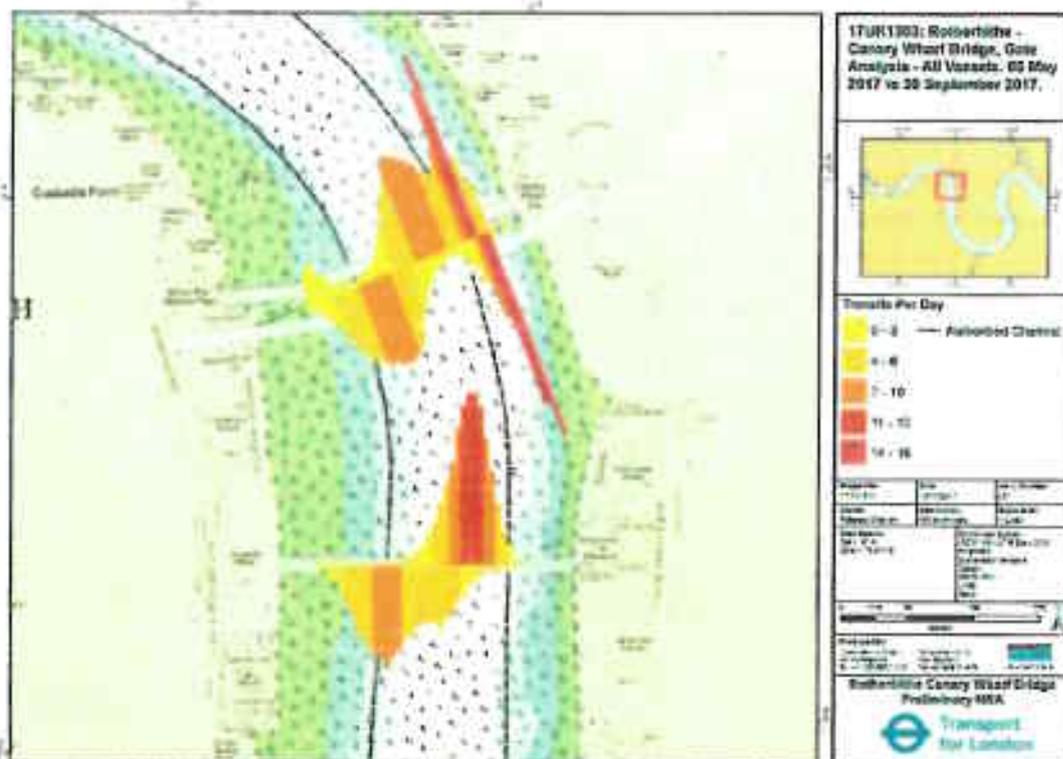


Figure 11: Vessel Transit Frequency - (all vessel types).

2.8 INCIDENT ANALYSIS

2.8.1.1 Incident data was provided by the PLA, for the years 2010 to 2017, however, the 2017 data is not a complete year containing data between January and June. The study area was extended to include data from the Lower Pool and Limehouse Reach in order to gain a holistic view of

incidents in the vicinity of the proposed bridge locations and to provide a means of benchmarking between locations.

2.8.1.2 Incidents, collectively referred to as events, were categorised into 'incidents' or 'accidents' where;

- a. An accident is defined as a navigational event involving one or more vessels that has adverse consequences. This includes collisions, contacts and groundings; and
- b. An incident is defined as an event that is outside of safe practice and has the potential to become an accident, for example; near misses, mechanical failures and navigational hazards.

2.8.1.3 Figure 12 shows incidents and accidents by type. In this case, collisions, contacts and near misses have been analysed in isolation as they were deemed integral to the assessment. As expected, incidents occur more frequently than accidents.

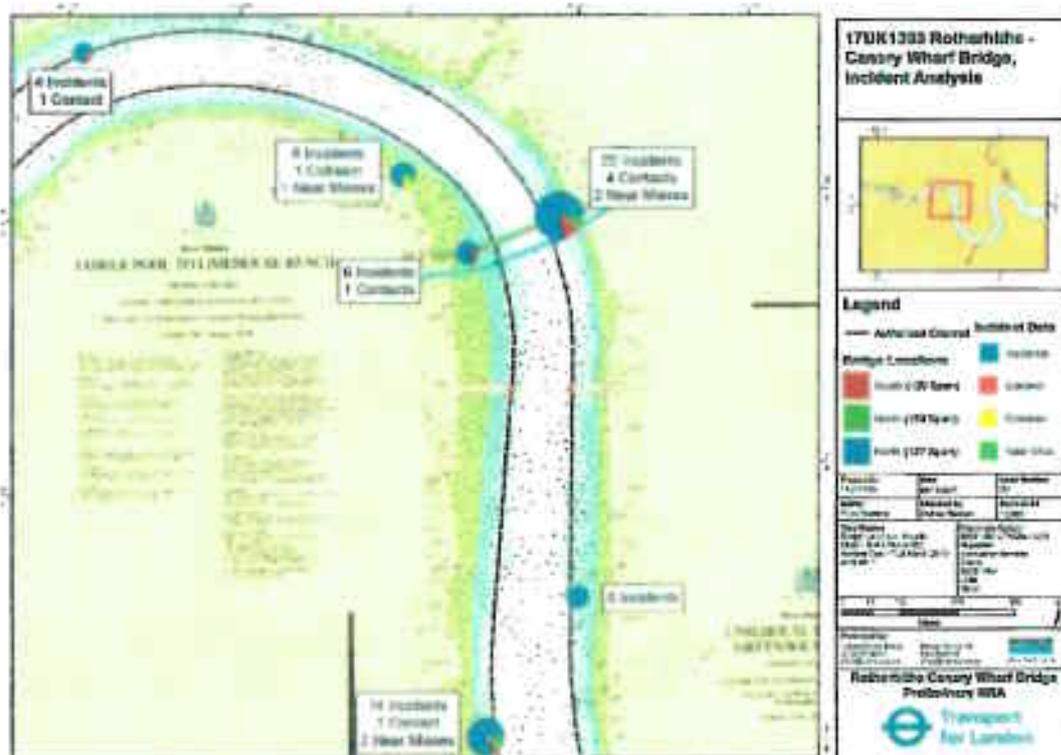


Figure 12: Proportional number of incidents /accidents within Lower Pool and Limehouse Reach.

2.8.1.4 The largest number of incidents occurred near to Canary Wharf Pier with a total of 28 events, representing 61% more events than the next most numerous event location, Greenland Pier. It should however, be noted that the PLA method of incident recording is to reference incidents to the nearest notable structure, indicating that while these incidents occurred

within the general area surrounding Canary Wharf Pier, with the exception of the contacts, they were not necessarily associated with the pier itself or the river immediately surrounding it. In the case, owing to a lack of existing structures near to the southern bridge option, with the exception of contacts, the event rate at this portion of the river may be under-represented.

2.8.1.5 The collision rate for this portion of Lower Pool/Limehouse Reach is low with only one recorded collision in 7.5 years.

3 CONSULTATION

3.1.1.1 Due to the preliminary nature of the risk assessment and limited time available, stakeholder consultation was limited to the PLA. The stakeholder consultation meeting was:

- **Port of London Authority**
 - Pinnacle House
 - 08-Nov-2017, 11:30-14:30:
 - [REDACTED] - PLA Harbour Master Upper;
 - [REDACTED] - PLA River Pilot;
 - [REDACTED] - Marico Marine; and
 - [REDACTED] - Marico Marine.

3.1.1.2 Meeting notes were drafted and agreed between the project team and the PLA – these can be found within Annex B.

3.1.1.3 The navigation issues and themes discussed as part of the consultation meeting were incorporated into the assessment of risk and the identification of suitable risk control measures.

4 NAVIGATION RISK ASSESSMENT

4.1 NAVIGATION RISK DEFINITIONS

4.1.1.1 The PLA has recently developed a standardised NRA methodology for River Works License applications. The following definitions apply to this methodology:

- Hazard - is an occurrence that creates an unsafe situation;
- Risk - is a measure of the likelihood and consequence of a hazard occurring;
- Risk Control - a measure to reduce either the likelihood of occurrence or the consequence of occurrence of a hazard (e.g. a "barrier" may reduce likelihood and a "mitigation" may reduce consequence).
- Initial Risk - is a measure of risk prior to additional risk controls being added (existing risk controls are included in this assessment);
- Residual Risk - is a measure of risk once additional risk controls have been added that were not in place at the time of the assessment; and

4.2 ASSESSMENT OF RISK

4.2.1.1 Risk is the product of the consequence and the likelihood of an unwanted event. The International Maritime Organisation guidelines define a hazard as "something with the potential to cause harm, loss or injury", the realisation of which results in an incident or accident. The potential for a hazard to be realised can be combined with an estimated or known consequence or outcome. This combination is termed 'risk'. Risk is, therefore, a measure of the likelihood and consequence of a particular hazard occurring.

4.2.1.2 The likelihood of a hazard occurring is sometimes difficult to assess. Quantitative methods can be utilised to inform the likelihood of a particular hazard occurring. Records of incidents can be helpful in determining likelihood rates, however, they are not solely in themselves a measure of likelihood suitable for assessing the risk of a future developments where a change in the system being assessed has occurred (just because a hazard has not been recorded in accident records, it does not mean it is not likely to occur). Other methods of determining likelihood include data analysis, simulation or trials.

4.2.1.3 To assess frequency and, to a lesser extent, consequence, of a hazard occurring it is necessary to use a combination of historical incident (including near miss data) statistics, local stakeholder judgement, quantitative modelling and analysis, and professional judgement.

4.2.1.4 Using the Port of London's risk assessment methodology, the risk assessment is scored by the combination of a "consequence" score and a "likelihood" score. Where consequence scores for people, property, business, environment, works / infrastructure, operations or publicity

are scored differently, the level of consequence chosen was primarily driven by the damage to "people" category.

4.2.1.5 The combination of consequence and frequency of occurrence of a hazard is combined using a risk matrix (see Table 1), which enables hazards to be ranked and a risk score assigned. The resulting scale can be divided into three general categories:

- Acceptable;
- As Low As Reasonably Practicable (ALARP); and
- Intolerable.

4.3 RISK REDUCTION

4.3.1.1 Risk control measures aim to reduce the risk of a hazard, and can affect either the likelihood and / or the consequence of that hazard (for example buoyage reduces the likelihood of a vessel grounding, whereas, lifejackets can be said to reduce the consequences of a grounding). It is possible to estimate or calculate the effectiveness a risk control measure has at reducing the risk of a hazard occurring and thereby determine risk control effectiveness. This is beneficial in determining the merits (either absolute or relative) of implementing a variety of risk control measures, which can also lead on to effective cost benefit analysis.

4.3.1.2 The effectiveness of additional risk controls is assessed against a nominal scale, which applies differing percentage reductions, based on their estimated effectiveness. The percentage reduction is then applied to either / or both, the likelihood or consequence values, essentially entailing a further calculation using the risk matrix, and a "residual" risk score is calculated.

4.3.1.3 As an example, take a hazard with a consequence score equivalent to £100,000. An additional risk control judged to reduce the consequence of this hazard by 20% will generate a residual consequence value, equivalent to £80,000, and the risk matrix is used to determine the residual risk score. The combined risk score in terms of likelihood and consequence is calculated the same as for baseline risk.

4.3.1.4 The application of additional risk control measures is assessed using a compound calculation. From the example above, a further risk control could be applied at 20%, which would reduce the consequence cost, from £80,000 to £64,000. A third risk control, with 10% effectiveness, would reduce the same consequence cost from £64,000 to £57,600, and so on. The residual risk score, with all these risk control measures in place, would therefore utilise the £57,600 consequence value in the calculation of risk.

Table 1: PLA risk assessment matrix and frequency / consequence categories

	FREQUENCY
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RISK ASSESSMENT MATRIX: RISK CRITERIA		Level 1	Level 2	Level 3	Level 4	Level 5
		Rare	Unlikely	Possible	Likely	Almost Certain
		One or more times greater than 100	One or more times in 100 years	One or more times in 10 years	One or more times per year	Ten or more times per year
CONSEQUENCE	5 – Loss of vessel or severe damage to vessel / environment. Multiple fatalities International news coverage.	Moderate (5)	High (10)	Extreme (15)	Extreme (20)	Extreme (25)
	4 – Major damage to vessel / environment. Single Fatality. National news coverage.	Minor (4)	Moderate (8)	High (12)	Extreme (16)	Extreme (20)
	3 – Moderate damage to vessel / environment. Moderate / major injury Regional news coverage.	Minor (3)	Moderate (6)	Moderate (9)	High (12)	Extreme (15)
	2 - Minor or superficial damage to vessel / environment. Minor injuries and local news coverage.	High (2)	Minor (4)	Moderate (6)	Moderate (8)	High (10)
	1 - Insignificant or no damage to vessel / equipment / environment. No injuries.	Slight (1)	Slight (2)	Minor (3)	Minor (4)	Moderate (5)
ACTION KEY	Slight (1– 2)	No Action is required.				
	Minor (3– 4)	No additional controls are required, monitoring is required to ensure no changes in circumstances.				
	Moderate (5– 9)	Efforts should be made to reduce risk to 'As low as reasonably practicable' (ALARP), but activity may be undertaken.				
	High (10– 14)	Efforts should be made to reduce risk to 'As low as reasonably practicable' (ALARP). Activity can only be undertaken with further additional controls.				
	Extreme (15– 25)	Intolerable risk. Activity not authorised.				

4.3.1.5 It should be noted that as risk (by definition) is a non-dimensional number (being a combination of likeliness and consequence), a 50% reduction in likelihood of hazard occurrence will not result in a 50% reduction in risk, because no similar reduction in consequences has been applied. Further, the matrix itself is non-linear in terms of likelihood occurrence and consequence magnitude, so that a reduction in 50% for likelihood for example, may relate to a likelihood change from 1 in 10 years to a 1 in 20 year. As can be seen in the

matrix this may only result in a small change in the risk score as the matrix to trying to accommodate for all likelihood eventualities on an exponential scale.

4.3.1.6 Also, it can be difficult to determine the exact effectiveness of risk controls in a dynamic and changing system such as a port, and, as such, a significant degree of subjectivity is commonly used where quantitative methods are not available or are prohibitively expensive to determine risk control effectiveness.

Table 2: Risk control effectiveness table - Consequence

% Reduction	Consequence Values				
	£1,000	£10,000	£100,000	£1,000,000	£10,000,000
0	£1,000	£10,000	£100,000	£1,000,000	£10,000,000
5	£950	£9,500	£95,000	£950,000	£9,500,000
10	£900	£9,000	£90,000	£900,000	£9,000,000
25	£750	£7,500	£75,000	£750,000	£7,500,000
35	£650	£6,500	£65,000	£650,000	£6,500,000
40	£600	£6,000	£60,000	£600,000	£6,000,000
50	£500	£5,000	£50,000	£500,000	£5,000,000
75	£250	£2,500	£25,000	£250,000	£2,500,000
80	£200	£2,000	£20,000	£200,000	£2,000,000
90	£100	£1,000	£10,000	£100,000	£1,000,000
95	£50	£500	£5,000	£50,000	£500,000
100	£0	£0	£0	£0	£0

Table 3: Risk control effectiveness table - Likelihood¹

% Reduction	Likelihood (return Period [1 in X yrs])				
	0.1	1	10	100	>100(e.g. 1000)
0	0.105	1.1	10.5	105.3	1000
5	0.11	1.1	11.1	111.1	
10	0.13	1.3	12.5	125.0	
20	0.20	2.0	20.0	200.0	
50	0.50	5.0	50	500	
80	1.00	10.0	100	1000	
90	2.00	20.0	200		
95	3.33	33.3	333		
97	5	50	500		
98	10	100	1000		
99	20	200			
99.5	33	333			
99.7	50	500			
99.8	100	1000			
99.9	200				
99.95	500				
99.98	1000				
100					

4.3.1.8 Fundamentally, the role of the PLA is to uphold navigational safety in the Thames. The implementation of a standardised risk framework applied across all hazards, no matter how subjective, remains a useful methodology, as the resulting scores can be used to judge the relative, and / or the absolute, merits of implementing additional risk controls.

4.4 HAZARD IDENTIFICATION

4.4.1.1 The identification of navigation hazards appropriate to the proposed bridge was undertaken in consultation with the PLA, from a standardised PLA list and through professional judgement.

4.4.1.2 The navigational hazard categories chosen were:

- Contact - Bridge Pier – East;
- Contact - Bridge Pier – West;
- Contact - Bridge Span;

¹ Note the matrix limits likelihood to a maximum of 1 in 1,000 years.

- Collision; and
- Grounding.

4.4.1.3 The geographic area of coverage for the NRA was determined as the vicinity of the bridge location works (Limehouse Reach).

4.4.1.4 A standardised category of vessel types was identified as being pertinent to the proposed bridge and geographic area (see **Table 4**).

Table 4: Vessel Categories

Vessel Types	Examples
> 15m Air Draught - Commercial	Cruise Ships, Large Dredgers, Naval Ships, Crane Barges, Dixie Queen, Thames Barges, Tall Ships.
> 15m Air Draught - Recreational	Yachts
< 15m Air Draught - Class 5/HSC/RIBs	Class 5 & HSC Passenger Vessels
< 15m Air Draught - Intra Port Trade Freight & Workboats	Tug & Tows, Motorised Barges, Port service craft
< 15m Air Draught - Recreational / Small Vessels	Powered and Un-powered vessels - e.g. motor yacht, motor boats,

4.4.1.5 It is re-emphasised that this assessment has not sought to include non-navigation related hazards that are not associated with the proposed bridge in this Pre.NRA, such as fire and explosion, slip trips and falls, for example, which if requiring consideration should fall with a health and safety risk assessment. Landside based hazards are not considered navigational hazards.

4.4.1.6 In total, 22 navigational hazards were identified as pertinent to this NRA, see **Table 5** for more details.

Table 5 - Hazard Identification table

Haz. Id	Hazard Type	Vessel Type
1	Contact - Bridge Pier - East / Canary Wharf Pier	> 15m Air Draught - Commercial
2	Contact - Bridge Pier - East / Canary Wharf Pier	> 15m Air Draught - Recreational
3	Contact - Bridge Pier - East / Canary Wharf Pier	< 15m Air Draught - Class 5/HSC/RIBs
4	Contact - Bridge Pier - East / Canary Wharf Pier	< 15m Air Draught - Intra Port Trade Freight & Workboats

Haz. Id	Hazard Type	Vessel Type
5	Contact - Bridge Pier - East / Canary Wharf Pier	< 15m Air Draught - Recreational / Small Vessels
6	Contact - Bridge Pier - West	> 15m Air Draught - Commercial
7	Contact - Bridge Pier - West	> 15m Air Draught - Recreational
8	Contact - Bridge Pier - West	< 15m Air Draught - Class 5/HSC/RIBs
9	Contact - Bridge Pier - West	< 15m Air Draught - Intra Port Trade Freight & Workboats
10	Contact - Bridge Pier - West	< 15m Air Draught - Recreational / Small Vessels
11	Contact - Bridge Span	> 15m Air Draught - Commercial
12	Contact - Bridge Span	> 15m Air Draught - Recreational
13	Collision as a result of Bridge	> 15m Air Draught - Commercial
14	Collision as a result of Bridge	> 15m Air Draught - Recreational
15	Collision as a result of Bridge	< 15m Air Draught - Class 5/HSC/RIBs
16	Collision as a result of Bridge	< 15m Air Draught - Intra Port Trade Freight & Workboats
17	Collision as a result of Bridge	< 15m Air Draught - Recreational / Small Vessels
18	Grounding	> 15m Air Draught - Commercial
19	Grounding	> 15m Air Draught - Recreational
20	Grounding	< 15m Air Draught - Class 5/HSC/RIBs
21	Grounding	< 15m Air Draught - Intra Port Trade Freight & Workboats
22	Grounding	< 15m Air Draught - Recreational / Small Vessels

4.5 EXISTING AND FUTURE RISK CONTROLS

4.5.1.1 The management of navigational risk on the River Thames is undertaken in line with the International Maritime Organisation Formal Safety Assessment methodology. Existing risk controls are in place and managed by the PLA. However, while controls are available to ensure safe navigation near bridges, these do not currently apply to Limehouse Reach. The risk assessment, therefore, considers additional controls which may need to be applied once a bridge is in place, all of which are already used in other locations on the River Thames. The list of possible risk controls considered is shown below in Table 6.

Table 6 – Additional Risk Controls

ID	Control Description
1	Relocate eastern bridge pier further from authorised channel
2	Relocate western bridge pier further from authorised channel
3	Passing disallowed within vicinity of bridge
4	Tugs to be made fast prior to bridge
5	Clear marking and lighting of bridge arch/piers
6	Adherence to bridge procedures
7	Increase span height
8	Increase number of openings
9	Co-ordination with Tower Bridge / abort points while inbound
10	Impact protection
11	Relocate Canary Wharf Jetty further from eastern bridge pier

5 KEY HAZARDS

5.1.1.1 Navigational hazards presented by a bridge structure built across the navigable river have been identified in section 4.4 above.

5.1.1.2 However, following consultation two key hazards were particularly identified in discussion, namely:

- Navigation in the vicinity of Canary wharf pier; and
- Large Vessel transits.

5.2 NAVIGATION IN THE VICINITY OF CANARY WHARF PIER

5.2.1.1 The presence of bridge piers close to the authorised channel, or on the margins of the river will contribute to increased risk of vessels making contact with the structure itself, colliding with each other as they modify their tracks to avoid the structure, or grounding should they navigate to close to the shore while avoiding the bridge structure.

5.2.1.2 The risk of two vessels colliding is also increased due to the structures (bridge piers) impeding visibility between two (or more) vessels resulting in a collision if avoiding action is not taken. This would be particularly pronounced in the case of the two northern options where the proposed eastern bridge pier would be very close to the existing intensively used Canary Wharf Pier (jetty).

5.2.1.3 The risk is further increased as fast ferries would be manoeuvring off the pontoon at an angle to general traffic proceeding up or down stream, making Collision more likely should they not be seen by approaching vessel (or vice versa) due to sight lines being obscured by the bridge pier.

5.2.1.4 This risk can be most effectively mitigated by ensuring that Canary Wharf Pier is re-sited, either by relocating the proposed bridge, moving the Canary Wharf Pier away from the proposed bridge pier, or re-designing the bridge pier and pier into a composite structure taking navigation safety into account. This would have additional advantages of ensuring that Canary Wharf Pier is not underneath the proposed bridge span, reducing potential for contact with

the bridge span, as well as reducing landside risks (for example of objects falling onto pontoon from the bridge).

- 5.2.1.5 For this reason, "relocate Canary Wharf Jetty further from eastern bridge pier" has been considered as a specific mitigating control measure, which can be seen to significantly reduce the navigational risk associated with both northern design options.

5.3 LARGE VESSEL TRANSITS

- 5.3.1.1 Large vessel transits were of particular concern to the PLA consultees. This is primarily those vessels in the group "large commercial vessels (>15m air draught)". This is effectively a class of vessel which will require a bridge opening, and which will be subject to pilotage (either by means of taking a PLA pilot on board, or by the vessel master holding a Pilotage Exemption Certificate). Examples of such vessels will include cruise ships, some large commercial vessels and visiting warships. These vessels are frequently limited in their ability to manoeuvre at low speeds, or to turn in the river should the need arise to abort their passage. Many may also not be able to stay afloat within the river if they are unable to reach their destination berths before the tide falls.

- 5.3.1.2 Therefore, a number of the possible controls have been identified that are designed to mitigate these concerns, which would enable risk to be reduced to an acceptable level if implemented (see Table 7 below).

Table 7: Large Vessel Transit Controls

Proposed control	Commentary
Passing disallowed within vicinity of bridge	Currently some of those vessels which would require bridge opening may be allowed to pass in the river close to the proposed bridge locations. This is unusual, and could be prevented following construction by amended navigation procedures.
Tugs to be made fast prior to bridge	Tugs are currently made fast to large vessels before they reach their destination berths (which are typically in the vicinity of Tower Bridge for inbound large vessels). This activity often takes place near the proposed bridge locations, so after construction of the bridge they would need to be made fast further downstream for inbound passages. This would ensure tug assistance is available for passage through the bridge opening, as well as mitigating against potential difficulties of making fast near the bridge. This would be achieved through revised procedures, but would incur additional costs for tug time.
Co-ordination with Tower Bridge / abort points while inbound	In order to mitigate against the possibility of large vessels being unable to complete their passage due to the bridge failing to open, it will be necessary to ensure that abort points are identified for inbound passages – the bridge must be confirmed open before vessels pass the agreed point. For outbound passages there are no abort points between Tower Bridge and Canary Wharf, so the new bridge will have

	to be confirmed open before outbound passage is commenced. Both scenarios could be ensured by revised procedure, but may require the bridge to be opened for significant periods for large vessel passages. It is possible to test the ability of vessel to wait should the bridge not open in time through simulation.
Adherence to bridge procedures	See above. Navigation procedures for all classes of vessel will need to be revised following construction.

6 RISK ASSESSMENT RESULTS

6.1.1.1 The identified hazards were assessed for each of the bridge locations using the methodology described in Section 4 of this report - North - 159m Span, North - 127m Span and South - 120m Span. The risk assessment results are presented in tabulated form in the following sub-sections and in Annex C.

6.2 NORTH SPAN 159M

Table 8: Hazard Risk Table North 159m

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Title	Baseline Risk	Baseline Level	Residual Risk	Residual Level	Risk Reduction
3	1	1	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Class 5/HSC/RIBs	10.5	High	6.4	Moderate	4.1
15	2	2	Collision as a result of Bridge - < 15m Air Draught - Class 5/HSC/RIBs ICW Other Vessel	9.6	Moderate	7.8	Moderate	1.8
22	3	3	Grounding - < 15m Air Draught - Recreational / Small Vessels	8.0	Moderate	7.2	Moderate	0.8
17	5	4	Collision as a result of Bridge - < 15m Air Draught - Recreational / Small Vessels ICW Other Vessel	7.1	Moderate	6.3	Moderate	0.8
1	8	5	Contact - Bridge Pier - East / Canary Wharf Pier - > 15m Air Draught - Commercial	8.0	Moderate	5.2	Moderate	2.8
10	6	6	Contact - Bridge Pier - West - < 15m Air Draught - Recreational / Small Vessels	6.7	Moderate	5.1	Moderate	1.6
16	6	7	Collision as a result of Bridge - < 15m Air Draught - Intra Port Trade Freight & Workboats ICW Other Vessel	6.2	Moderate	5.4	Moderate	0.8
20	6	8	Grounding - < 15m Air Draught - Class 5/HSC/RIBs	6.0	Moderate	4.4	Moderate	1.6
4	6	9	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Intra Port Trade Freight & Workboats	6.0	Moderate	5.2	Moderate	0.8
5	13	10	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Recreational / Small Vessels	5.0	Moderate	4.5	Minor	0.5
21	11	11	Grounding - < 15m Air Draught - Intra Port Trade Freight & Workboats	5.0	Moderate	4.5	Minor	0.5
14	11	12	Collision as a result of Bridge - > 15m Air Draught - Recreational ICW Other Vessel	5.0	Moderate	4.2	Minor	0.8
11	6	13	Contact - Bridge Span - > 15m Air Draught - Commercial	6.0	Moderate	4.0	Minor	2.0
6	14	14	Contact - Bridge Pier - West - > 15m Air Draught - Commercial	4.0	Minor	3.1	Minor	0.9
8	14	15	Contact - Bridge Pier - West - < 15m Air Draught - Class 5/HSC/RIBs	4.0	Minor	2.5	Minor	1.5
9	14	16	Contact - Bridge Pier - West - < 15m Air Draught - Intra Port Trade Freight & Workboats	4.0	Minor	3.4	Minor	0.6
19	14	17	Grounding - > 15m Air Draught - Recreational	4.0	Minor	3.4	Minor	0.6
2	14	18	Contact - Bridge Pier - East / Canary Wharf Pier - > 15m Air Draught - Recreational	4.0	Minor	3.2	Minor	0.8
18	20	19	Grounding - > 15m Air Draught - Commercial	3.0	Minor	2.1	Minor	0.9
13	20	20	Collision as a result of Bridge - > 15m Air Draught - Commercial ICW Other Vessel	3.0	Minor	3.0	Minor	0.0
12	14	21	Contact - Bridge Span - > 15m Air Draught - Recreational	4.0	Minor	3.0	Minor	1.0
7	22	22	Contact - Bridge Pier - West - > 15m Air Draught - Recreational	3.0	Minor	2.0	Minor	1.0

6.3 NORTH SPAN 127M

Table 9: Hazard Risk Table North 127m

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Title	Baseline Risk	Baseline Level	Residual Risk	Residual Level	Risk Reduction
3	1	1	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Class 5/HSC/RIBs	10.5	High	9.4	Moderate	1.1
15	2	2	Collision as a result of Bridge - < 15m Air Draught - Class 5/HSC/RIBs ICW Other Vessel	9.0	Moderate	7.4	Moderate	1.6
22	3	3	Grounding - < 15m Air Draught - Recreational / Small Vessels	8.0	Moderate	6.7	Moderate	1.3
6	3	4	Contact - Bridge Pier - West - > 15m Air Draught - Commercial	8.0	Moderate	6.2	Moderate	1.8
1	3	5	Contact - Bridge Pier - East / Canary Wharf Pier - > 15m Air Draught - Commercial	8.0	Moderate	6.2	Moderate	1.8
17	6	6	Collision as a result of Bridge - < 15m Air Draught - Recreational / Small Vessels ICW Other Vessel	7.6	Moderate	5.8	Moderate	1.8
4	7	7	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Intra Port Trade Freight & Workboats	6.0	Moderate	5.2	Moderate	0.8
9	7	8	Contact - Bridge Pier - West - < 15m Air Draught - Intra Port Trade Freight & Workboats	6.0	Moderate	5.1	Moderate	0.9
16	7	9	Collision as a result of Bridge - < 15m Air Draught - Intra Port Trade Freight & Workboats ICW Other Vessel	6.0	Moderate	5.1	Moderate	0.9
20	7	10	Grounding - < 15m Air Draught - Class 5/HSC/RIBs	6.0	Moderate	5.0	Moderate	1.0
5	12	11	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Recreational / Small Vessels	5.0	Moderate	4.9	Minor	0.1
21	12	12	Grounding - < 15m Air Draught - Intra Port Trade Freight & Workboats	5.0	Moderate	4.2	Minor	0.8
14	12	13	Collision as a result of Bridge - > 15m Air Draught - Recreational ICW Other Vessel	5.0	Moderate	4.1	Minor	0.9
11	7	14	Contact - Bridge Span - > 15m Air Draught - Commercial	6.0	Moderate	4.0	Minor	2.0
10	15	15	Contact - Bridge Pier - West - < 15m Air Draught - Recreational / Small Vessels	4.0	Minor	3.7	Minor	0.3
19	15	16	Grounding - > 15m Air Draught - Recreational	4.0	Minor	3.8	Minor	0.2
8	15	17	Contact - Bridge Pier - West - < 15m Air Draught - Class 5/HSC/RIBs	4.0	Minor	3.2	Minor	0.8
2	15	18	Contact - Bridge Pier - East / Canary Wharf Pier - > 15m Air Draught - Recreational	4.0	Minor	3.1	Minor	0.9
18	20	19	Grounding - > 15m Air Draught - Commercial	3.9	Minor	3.2	Minor	0.7
13	20	20	Collision as a result of Bridge - > 15m Air Draught - Commercial ICW Other Vessel	3.9	Minor	3.0	Minor	0.9
12	15	21	Contact - Bridge Span - > 15m Air Draught - Recreational	4.0	Minor	3.0	Minor	1.0
7	22	22	Contact - Bridge Pier - West - > 15m Air Draught - Recreational	3.0	Minor	2.8	Minor	0.2

6.4 SOUTH SPAN 120M

Table 10: Hazard Risk Table South 120m

Hazard ID	Baseline Hazard Rank	Residual Hazard Rank	Hazard Title	Baseline Risk	Baseline Level	Residual Risk	Residual Level	Risk Reduction
22	2	1	Grounding - < 15m Air Draught - Recreational / Small Vessels	8.0	Moderate	7.3	Moderate	0.7
15	1	2	Collision as a result of Bridge - < 15m Air Draught - Class 5/HSC/RIBs ICW Other Vessel	9.0	Moderate	7.1	Moderate	1.9
17	5	3	Collision as a result of Bridge - < 15m Air Draught - Recreational / Small Vessels ICW Other Vessel	7.0	Moderate	5.9	Moderate	1.1
1	3	4	Contact - Bridge Pier - East - > 15m Air Draught - Commercial	7.2	Moderate	5.4	Moderate	1.8
6	3	4	Contact - Bridge Pier - West - > 15m Air Draught - Commercial	7.2	Moderate	5.4	Moderate	1.8
20	6	6	Grounding - < 15m Air Draught - Class 5/HSC/RIBs	6.0	Moderate	5.3	Moderate	0.7
4	6	7	Contact - Bridge Pier - East - < 15m Air Draught - Intra Port Trade Freight & Workboats	6.0	Moderate	5.2	Moderate	0.8
16	6	8	Collision as a result of Bridge - < 15m Air Draught - Intra Port Trade Freight & Workboats ICW Other Vessel	6.0	Moderate	5.2	Moderate	0.8
9	6	9	Contact - Bridge Pier - West - < 15m Air Draught - Intra Port Trade Freight & Workboats	6.0	Moderate	5.1	Moderate	0.9
3	6	10	Contact - Bridge Pier - East - < 15m Air Draught - Class 5/HSC/RIBs	6.0	Moderate	5.0	Moderate	1.0
21	12	11	Grounding - < 15m Air Draught - Intra Port Trade Freight & Workboats	5.0	Moderate	4.2	Minor	0.8
14	12	12	Collision as a result of Bridge - > 15m Air Draught - Recreational ICW Other Vessel	5.0	Moderate	4.2	Minor	0.8
11	6	13	Contact - Bridge Span - > 15m Air Draught - Commercial	6.0	Moderate	4.6	Minor	1.4
10	14	14	Contact - Bridge Pier - West - < 15m Air Draught - Recreational / Small Vessels	4.0	Minor	3.5	Minor	0.5
5	14	14	Contact - Bridge Pier - East - < 15m Air Draught - Recreational / Small Vessels	4.0	Minor	3.5	Minor	0.5
7	14	16	Contact - Bridge Pier - West - > 15m Air Draught - Recreational	4.0	Minor	3.2	Minor	0.8
19	14	17	Grounding - > 15m Air Draught - Recreational	4.0	Minor	3.1	Minor	0.9
8	14	18	Contact - Bridge Pier - West - < 15m Air Draught - Class 5/HSC/RIBs	4.0	Minor	3.2	Minor	0.8
2	14	19	Contact - Bridge Pier - East - > 15m Air Draught - Recreational	4.0	Minor	3.1	Minor	0.9
18	21	20	Grounding - > 15m Air Draught - Commercial	3.9	Minor	3.1	Minor	0.8
13	21	21	Collision as a result of Bridge - > 15m Air Draught - Commercial ICW Other Vessel	3.9	Minor	3.0	Minor	0.9
12	14	22	Contact - Bridge Span - > 15m Air Draught - Recreational	4.0	Minor	3.8	Minor	0.2

6.5 COMPARISON

Table 11 – Baseline Risk (No controls) and Residual Risk (with controls) compared by Bridge Location

Hazard ID	Hazard Title	North 15m		North 27m		North 40m	
		Baseline Risk	Residual Risk	Baseline Risk	Residual Risk	Baseline Risk	Residual Risk
1	Contact - Bridge Pier - East / Canary Wharf Pier - > 15m Air Draught - Commercial	6.0	6.1	6.0	6.1	7.2	5.4
2	Contact - Bridge Pier - East / Canary Wharf Pier - > 15m Air Draught - Recreational	4.0	3.7	4.0	3.1	4.0	3.3
3	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Class 5/HSC/RIBs	10.5	9.4	10.5	9.4	6.0	5.0
4	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Intra Port Trade Freight & Workboats	5.0	5.2	6.0	5.2	6.0	5.2
5	Contact - Bridge Pier - East / Canary Wharf Pier - < 15m Air Draught - Recreational / Small Vessels	3.0	4.3	3.0	3.5	4.0	3.5
6	Contact - Bridge Pier - West - > 15m Air Draught - Commercial	4.0	3.7	8.0	6.1	7.2	5.4
7	Contact - Bridge Pier - West - > 15m Air Draught - Recreational	5.0	3.5	3.0	3.7	4.0	3.3
8	Contact - Bridge Pier - West - < 15m Air Draught - Class 5/HSC/RIBs	4.0	3.5	4.0	3.2	8.0	6.7
9	Contact - Bridge Pier - West - < 15m Air Draught - Intra Port Trade Freight & Workboats	4.0	3.7	6.0	5.1	6.0	5.1
10	Contact - Bridge Pier - West - < 15m Air Draught - Recreational / Small Vessels	6.0	5.6	6.0	3.7	4.0	3.3
11	Contact - Bridge Span - > 15m Air Draught - Commercial	4.0	4.0	6.0	4.9	6.0	4.0
12	Contact - Bridge Span - > 15m Air Draught - Recreational	4.0	3.6	4.0	3.0	5.0	3.0
13	Collision as a result of Bridge - > 15m Air Draught - Commercial ICW Other Vessel	3.0	4.0	3.0	3.0	3.0	3.0
14	Collision as a result of Bridge - > 15m Air Draught - Recreational ICW Other Vessel	3.0	4.1	3.0	4.1	5.0	4.1
15	Collision as a result of Bridge - < 15m Air Draught - Class 5/HSC/RIBs ICW Other Vessel	6.0	3.8	3.0	2.4	3.0	2.3
16	Collision as a result of Bridge - < 15m Air Draught - Intra Port Trade Freight & Workboats ICW Other Vessel	6.0	5.4	6.0	5.3	6.0	5.2
17	Collision as a result of Bridge - < 15m Air Draught - Recreational / Small Vessels ICW Other Vessel	7.0	6.3	7.0	5.8	7.0	5.8
18	Grounding - > 15m Air Draught - Commercial	3.0	3.1	3.0	2.1	3.0	2.1
19	Grounding - > 15m Air Draught - Recreational	4.0	3.4	4.0	2.7	4.0	3.3
20	Grounding - < 15m Air Draught - Class 5/HSC/RIBs	6.0	5.4	6.0	5.0	6.0	5.3
21	Grounding - < 15m Air Draught - Intra Port Trade Freight & Workboats	5.0	6.3	5.0	6.3	5.0	6.2
22	Grounding - < 15m Air Draught - Recreational / Small Vessels	8.0	7.2	8.0	6.7	8.0	7.3
Total Risk Scores		122.3	104.2	125.3	103.5	120.2	98.3
Risk Reduction		18.1		22.8		21.9	

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 15M VESSEL HEIGHT / WIDTH REQUIREMENTS

- 7.1.1.1 It is noted that for the purposes of this Pre-NRA only preliminary conceptual designs of the proposed bridges have been considered. For vessels in excess of 15m air draught, it has been assumed that the full width between the bridge piers (to the limits of the authorised channel) will be available (including any impact protection, or structural overhang from the bridge deck, or raised / swung spans).
- 7.1.1.2 For those vessels of less than 15m air draught, there will be a choice of navigating through the central span (bridge in closed position) or for smaller (lower air draught) vessels, through the nearshore spans.
- 7.1.1.3 N.B. – for the purposes of this preliminary assessment it has been assumed that navigation will be possible either side of the main bridge piers. This assumption will need to be reviewed once designs are developed.
- 7.1.1.4 It is self-evident that if obstructions are placed in the waterway (e.g. bridge piers), mariners will of course plan passages to avoid them. This is illustrated for the example of Tower Bridge (the first bridge upstream of the study site) in the traffic analysis plot below (Figure 13).
- 7.1.1.5 It is clear that vessels will not normally pass very close to obstructions such as bridge piers – leaving a sensible margin of safety between themselves and the obstruction. This distance has been observed to be in the order of 15m (as identified through traffic analysis and confirmed during consultation).
- 7.1.1.6 To ensure safe navigation for vessels with maximum air draught, the minimum width of span subject to minimum air draught is required to be at least 40m (confirmed during consultation). This width is similar to that available at other bridges upstream of the study area. The swept path plot of the vessel Dixie Queen (see Figure 14) illustrates the need for this minimum available width when the bridge is “closed”.

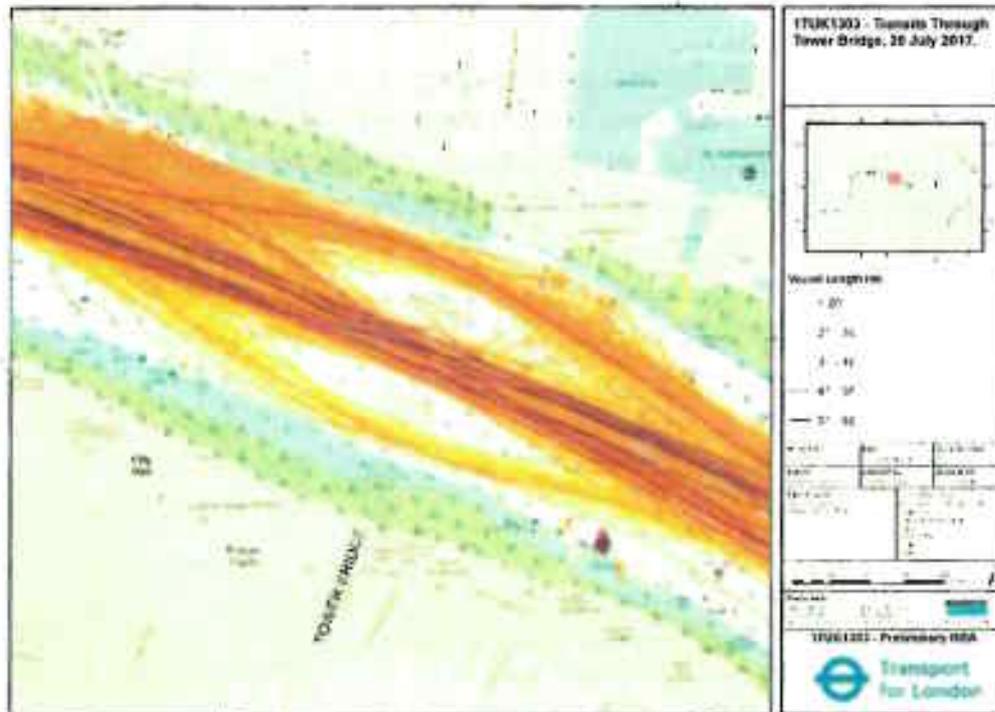


Figure 13 – Traffic Analysis in the Vicinity of Tower Bridge

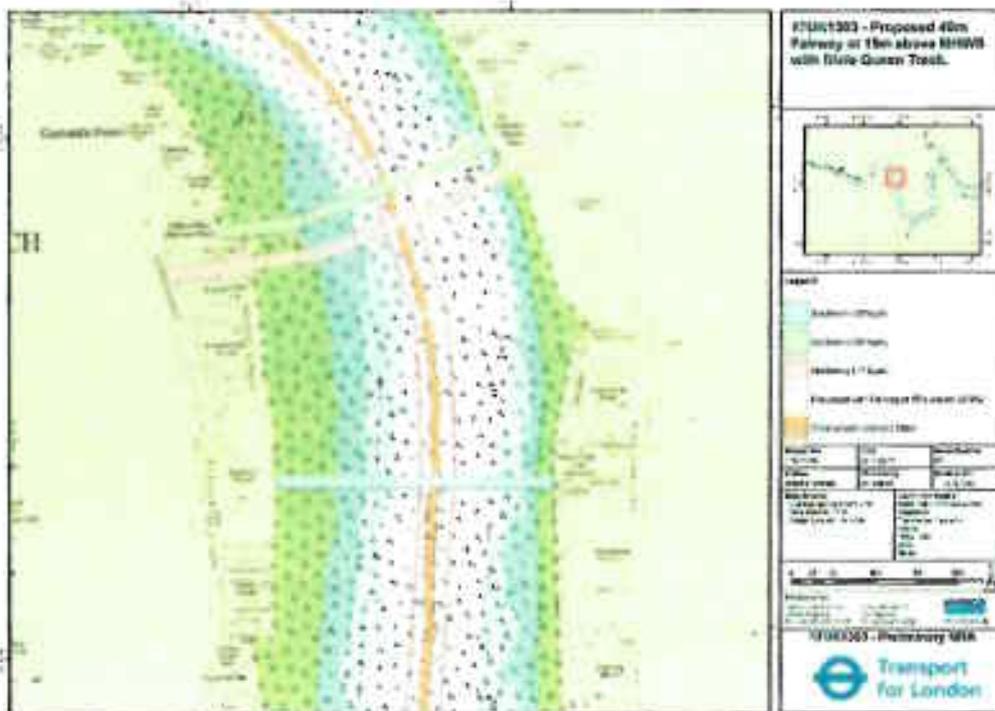


Figure 14 – "Dixie Queen" Swept Path

7.2 PROPOSED FUTURE CONTROLS

7.2.1.1 The risk analysis, performed for each proposed bridge location considered the likely effect posed by each design on navigational safety. The potential risk reduction achieved by considering additional controls for each hazard scenario was then assessed (note that not all controls apply to every hazard scenario, but all controls are considered for each proposed location).

7.2.1.2 The cumulative effect of each control at each bridge location has been calculated and results are summarised in Figure 13, below.

Table 12 – Controls Considered to Reduce Baseline Risk

ID	Name	Bridge Location		
		North159m	North127m	South120m
		Cumulative Risk Reduction		
1	Relocate eastern bridge pier further from authorised channel	1.48	4.19	4.56
2	Relocate western bridge pier further from authorised channel	1.42	4.18	4.43
3	Passing disallowed within vicinity of bridge	1.49	1.49	1.50
4	Tugs to be made fast prior to bridge	1.07	1.07	1.08
5	Clear marking and lighting of bridge arch/piers	2.25	2.25	2.27
6	Adherence to bridge procedures	4.08	4.08	4.10
7	Increase span height	2.45	2.45	2.45
8	Increase number of openings	0.81	0.81	0.81
9	Co-ordination with Tower Bridge / abort points while inbound	0.81	0.81	0.81
10	Impact protection	1.96	2.31	2.14
11	Relocate Canary Wharf Jetty further from eastern bridge pier	1.02	1.36	0.00

7.2.1.3 It is clear that many of the most effective controls at reducing risk are related to bridge design and location and should, therefore, be considered as the bridge design continues to be developed:

- Locate eastern bridge pier as far as possible from the authorised channel;
- Locate western bridge pier as far as possible from the authorised channel;

- In the case of the northern options, review the location of Canary Wharf Jetty to deconflict location with eastern bridge pier
- Clear marking and lighting of bridge arch/piers;
- Increase span height; and
- Impact protection.

Following construction of a bridge, the most effective operational controls will be ensuring that all procedures are followed and enforced.

7.3 CONCLUSIONS

7.3.1.1 Initial baseline assessment of navigation in Limehouse Reach (assuming bridge construction takes place at any one of the three proposed locations) identified only 2 high risk hazard scenarios: "Collision as a result of Bridge - < 15m Air Draught - Class 5/HSC/RIBs ICW Other Vessel" for both northern bridge options. This can be directly attributed to the close proximity of the existing intensively used Canary Wharf Pier to the east of the proposed piers of both northern bridge options. All other hazard scenarios for all three design options were assessed to be either moderate or minor without further mitigation.

7.3.1.2 Following assessment of additional risk controls, it was demonstrated that risk could be reduced in all scenarios to moderate or minor (below the ALARP range, and likely to be acceptable subject to consideration of all other factors).

7.3.1.3 The risk assessment process demonstrated that:

- Without mitigation: Option North 127m presented the highest potential risk to navigational safety, while the Southern option presented the lowest risk, though differences were small;
- It was possible to mitigate the risk for all options, with the greatest potential risk reduction being achieved for North 127m; and
- Following risk mitigation, the location presenting the lowest residual risk score remained the Southern option.

7.3.1.4 It should be noted that mitigation for the two northern options, while achievable, may be more difficult in practical terms as this would require relocation of either the eastern bridge pier and / or Canary Wharf Pier to be effective.

7.3.1.5 The southern option generally has somewhat lower residual risk scores than both of the northern options due to its location further away from a bend in the river, affording better

visibility and control for vessels approaching from either direction. It is also further removed from intense passenger vessel activity in the vicinity of Canary Wharf Pier.

7.4 RECOMMENDATIONS

7.4.1.1 This preliminary Navigation Risk Assessment has demonstrated that it may be feasible to construct a bridge at any of the three locations identified, with the southern location being favoured in terms of navigational safety (only).

7.4.1.2 Before the design is finalised it is recommended that:

- Risk assessment be repeated once bridge designs and locations, and construction methodology are more detailed;
- The detailed design pays particular attention to:
 - Relocating eastern bridge pier further from authorised channel;
 - Relocating western bridge pier further from authorised channel;
 - Deconflicting bridge structure from Canary Wharf Pier (move pontoon, or move bridge pier "in line" with pontoon) in the case of a northern option.
 - Clear marking and lighting of bridge arch/piers;
 - Increase span height;
 - Impact protection; and
- Procedures developed for the proposed bridge be based closely on current bridges, and be considered in a full NRA before construction;
- Simulation studies are conducted for large commercial vessels passing through the proposed bridge structure with span open; and
- Simulation studies are conducted to test abort procedures developed for both in and outbound commercial vessels.

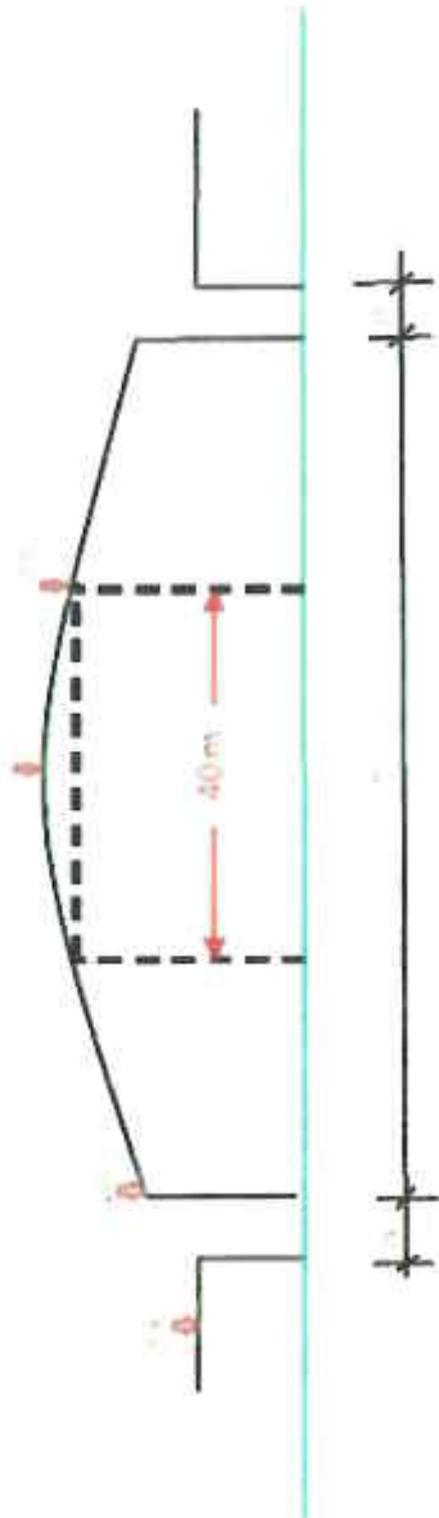
Annex A Bridge Drawings

North Span – 159m

North Span – 127m

South Span – 120m

Air Draught



Annex B Meeting Notes

Minutes of Consultation Meeting held on 08-Nov-2017

Client: TFL
Project: 17UK1303 TFL Rotherhithe to Canary Wharf Bridge
Venue: Port of London Authority (PLA), Pinnacle House, London
Date of Meeting: 08-November-2017 1400-1530

Present: PLA
PLA

Marico Marine
Marico Marine



Apologies: N/A

Item	Action item / Notes for the record	
1	Introduction Attendees introduced themselves to each other. WH was introduced as the most recent recruit to Marico Marine. MT summarised progress with project from the PLA / TFL perspective as "very little" especially wrt communication with architects. It was noted that discussion is based on a very simplistic outline design with only pier positions and indicative span heights being considered at this stage. MT noted that public consultation had already commenced, but at a very "broad level" with consideration only being given to possible "high" or "low" bridges.	
2	Review of Marico work to date. Marico has produced new traffic flow plots based on the three preferred options for location (North wider span, North narrower span and South). The central location has not been considered. MT noted that none of these preferred options appeared to consider his recommendations to the designers regarding pier positions. ER shared the very rough sketch of the proposed bridge cross sections. PLA raised same questions as identified by Marico – step from 9m to 12m soffit heights; radius meaning 15m clearance is at a single point, with effective clearance nearer 12m. MT emphasised that the useable width at minimum clearance must be both reasonable, AND related to where main traffic flows occur. MT and RI both agreed that the useable width should be in the region of 40m (similar to other bridges), and that extremes of this width would need to be clearly marked.	

	It was noted that the air draught of the "Dixie Queen" was still not accurately known, and measurements were still awaited from TFL.	
3	Discussion of Options as assessed by Marico	
	<p>Bridge opening method. MT thought that (vertical) lift bridge ruled out as designers could not commit to impact protection preventing lifted span falling in event of impact. Bascule unlikely due to width limitations if less than 90-degree lift. Favourite is opposing dual swing, with each side swinging in same direction as traffic flow.</p> <p>In relation to tug / tow track plots it was noted that tracks were those of tug AIS sensor, and while these seem to "cut the corner" on outbound passages, in fact the barges are likely to be much closer to, or within the authorised channel.</p> <p>In relation to Ocean Majesty RI noted she is the "most difficult ship" to use the reach, and therefore a good example to consider. The seemingly "erratic" outbound track on plot is quite typical.</p> <p>Noted that swept paths are only an indication of past passages, and cannot indicate future trends. All previous passages have "gone well".</p> <p>Tugs – guidance but no rules. However all large ships which are going to swing will already have tugs in attendance. Noted that currently these make fast in this reach, so procedures will have to be amended to allow for making fast earlier (in bound).</p> <p>MT was not keen on <i>additional</i> tugs as a mitigation factor for the bridge.</p> <p>Abort points for bridge – currently abort for Tower Bridge passage is Convoys Wharf. Consideration needs to be given if this will be appropriate for new bridge – decision to abort will have to begin well downstream of Convoys. Time factor to be considered in detailed NRA</p> <p>Outbound aborts not feasible as passage is on ebb tide and large vessels cannot "back up", therefore requirement to have new bridge confirmed open at same time as Tower Bridge lift / passage commences</p>	
4	Other procedures	
	<p>Procedures exist for all bridge passages. For consistency MT requires that new bridge procedures be closely based on those for Tower Bridge (future control).</p> <p>Currently there are occasional (larger) vessel passes in the reach. Procedures would need to address reduction in channel width, and limit where such passes can take place.</p>	
5	NRA	
	<p>There was some discussion on the categories of vessel and hazards identified for consideration in the preliminary NRA.</p> <p>It was felt that SOLAS / Non SOLAS did not accurately capture the vessel types in relation to the issues raised by the bridge proposals.</p> <p>MT suggested using the 40m pilotage as a basis for grouping commercial vessels.</p> <p>Categories could be:</p> <ol style="list-style-type: none"> 1. Commercial vessels >40m loa 	

	<ol style="list-style-type: none"> 2. Commercial vessels <40m loa (Thames barges and similar considered commercial) 3. River freight (eg Cory's tugs and tows). Generally not requiring bridge opening, though noted some barges have high cargo, eg cranes, but could be captured in commercial above) 4. HSC / RHIBS / Class 5 (not requiring bridge opening) 5. Workboats and other small powered craft 6. Recreational traffic (may or may not require bridge opening?) <p>Hazards:</p> <p>It was confirmed that the only Hazards requiring assessment as a result of the bridge proposal are:</p> <ol style="list-style-type: none"> 1. Contact 2. Collision 3. Grounding 	
6	Other considerations	
	<p>MT made the following observations which may be pertinent to the initial or operational risk assessments:</p> <ul style="list-style-type: none"> o Need to consider operational reliability of bridge (redundancy of systems) o Variations to soffit profile will inevitably drive changes to traffic density / tracks beyond immediate bridge location o Need to be identify 15m air draught width requirements - PLA recommended approximately 40m include marking. o Consideration to marking / lighting bridge o No intermediate piers (shore side spans) o Need to consider existing Canary Wharf Pier – new bridge pier location may be best adjusted rather than moving existing jetty. Consider in preliminary NRA. o Rowing Code of Practice needs to be reviewed (Current “crossing point” in conflict) 	
7	Conclusion	
	ER confirmed the initial NRA was due to be complete by the end of November. Thoughts to be shared with MT before submission.	

Annex C Risk Registers

North Span – 159m

North Span – 127m

South Span – 120m