

SILVERTOWN TUNNEL

Volume 3: Project Agreement – Schedules 2 to 31

Schedule 11 – TfL Technology Requirements

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SCHEDULE 11

TFL TECHNOLOGY REQUIREMENTS

Part 1 - TfL Technology D&C Requirements

1. General Requirements

- 1.1 In performing its obligations pursuant to this Schedule 11 (*TfL Technology Requirements*) and this Agreement, Project Co shall:
- 1.1.1 comply with BD78/99 (Design of Road Tunnels) and Series 1500 of the SHW as detailed in Part 2 (*Design Standards and Specifications*) of Schedule 10 (*Design and Construction Requirements*);
 - 1.1.2 use a schema to label and colour code all cabling and fibre installed as part of the Works (such schema shall be subject to TfL's prior written consent); and
 - 1.1.3 apply network security measures and comply with the Cyber Security Requirements to ensure that TfL's IP network is not compromised.

2. Project Co and TfL Network and Systems Interface

- 2.1 Project Co shall design and construct the Project Co TCS in accordance with the requirements of this Schedule 11 (*TfL Technology Requirements*) and Schedule 10 (*Design and Construction Requirements*).
- 2.2 Project Co shall:
- 2.2.1 ensure that the Project Co TCS is fully compatible with and interfaces with the TfL TCS;
 - 2.2.2 ensure that the TfL NSP installs, tests and commissions Resilient Peering Links between the Project Co TCS and the TfL TCS with the Core Nodes at the following locations on the TfL Network:
 - a. POP EIDL; and
 - b. the TfL Equipment Space South (as installed by Project Co pursuant to paragraph 2.4);
 - 2.2.3 ensure that the connection between the Project Co TCS and the TfL TCS is fully functional;
 - 2.2.4 use all reasonable endeavours to minimise the bandwidth requirements between the Project Co TCS and the TfL TCS which shall not, in any case, be greater than 150Mb/s;
 - 2.2.5 ensure that the interface described in paragraph 2.2.1 enables:
 - a. continuous monitoring and control of all devices which are controlled by the Project Co TCS by staff in the LSTOC control room without the direct use of the Project Co TCS;

- b. Project Co to monitor, control or request action by any TfL devices required by the Operation Strategy;
 - c. effective and efficient implementation of all Incident Response Plans in accordance with Schedule 18 (*Operation and Maintenance Requirements*);
 - d. continuous visibility of the status of all elements of the TSMS as described in paragraph 7 (*Tunnel Safety Management System*) of Part 2 (*Operation Requirements*) of Schedule 18 (*Operation and Maintenance Requirements*); and
 - e. bi-directional transfer between the Project Co TCS and the TfL TCS of all alerts, actions, responses, logs, reports and all similar information generated by the Project Co TCS or the TfL TCS;
- 2.2.6 establish the interface described in paragraph 2.2.1 via the Horus API and, to the extent that the Horus API does not support such functionality, Project Co shall establish the interface directly between the Project Co TCS and the TfL TCS or subsystems;
- 2.2.7 ensure that TfL and any TfL Related Parties are able to diagnose network connectivity issues between the Project Co TCS and associated end point devices and the TfL TCS or LTRACS Network; and
- 2.2.8 discharge the obligations set out in this paragraph 2.2 without installing any equipment in the LSTOC control room.
- 2.3 Project Co shall ensure that priority and primacy of control of all devices controlled by the Project Co TCS shall be user configurable following the Permit to Use Date.
- 2.4 Project Co shall purchase from TfL's NSP and install a POP with a Core Node on the LTRACS Network in the TfL Equipment Space South and shall ensure such Core Node is commissioned by TfL's NSP. TfL shall be entitled to witness such commissioning.
- 2.5 Project Co shall ensure that the Core Node in the TfL Equipment Space South installed pursuant to paragraph 2.4 is connected by diverse routes to TfL's NSP.
- 2.6 Project Co shall not be permitted to install any equipment at:
- 2.6.1 POP BW; or
 - 2.6.2 POP EIDL,
- other than as specifically required pursuant to this Schedule 11 (*TfL Technology Requirements*).
- 2.7 Project Co shall ensure that the Design Data relating to the Project Co TCS and TfL TCS interface submitted to TfL under the Review Procedure shall include, but not be limited to, the following:
- 2.7.1 documentation of all proposed interfaces between the Project Co TCS, the tunnel equipment and the TfL TCS;
 - 2.7.2 the physical routing of any fibre and all associated equipment;

- 2.7.3 the specification for any proposed fibre and all associated equipment;
- 2.7.4 the network architecture including full network configuration with the LTRACS Network;
- 2.7.5 the IP addressing schema, which shall be agreed with TfL in advance of submission to the Review Procedure;
- 2.7.6 details of the bandwidth requirements between the Project Co TCS and the TfL TCS;
- 2.7.7 evidence to support interoperability and compatibility including network and routing configuration and evidence of consultation with relevant TfL NSPs; and
- 2.7.8 a rationale demonstrating how the design meets the requirements of this Schedule 11 (*TfL Technology Requirements*).

3. LTRACS Network

- 3.1 Project Co shall ensure that it does not by any act or omission affect the operational functionality of the LTRACS Network by performing the Works.
- 3.2 Where any LTRACS Network equipment in the vicinity of the A102 passes through or is located on the Project Land, Project Co shall design and install rerouting for this equipment (the "**LTRACS Rerouting**") via the TfL Equipment Space South, including but not limited to, cable routing, ducting, draw pits, draw ropes and jointing locations but excluding the installation of cabling for the rerouting.
- 3.3 Project Co shall provide all required access to the Site to allow TfL or any TfL Related Party to install cabling for any rerouting required pursuant to paragraph 3.2.

4. TfL Cables

- 4.1 Project Co shall design and install additional fibre links in accordance with this Schedule 11 (*TfL Technology Requirements*) for TfL's sole use.
- 4.2 Project Co shall design, install, test and commission:
 - 4.2.1 an additional fibre link from the TfL Equipment Space North to POP EIDL (the "**Additional Fibre 1**");
 - 4.2.2 an additional fibre link from the TfL Equipment Space South to the TfL Equipment Space North (the "**Additional Fibre 2**"); and
 - 4.2.3 ducting for an additional fibre link from the TfL Equipment Space South to intersect with TfL's existing LTRACS Network ducting on the west of the A102 at the edge of the Site adjacent to the Blackwall Tunnel (the "**Additional Fibre 3 Ducting**") and Project Co shall ensure that the design and installation of Additional Fibre 3 Ducting includes the capability for an extension of Additional Fibre 3 Ducting to POP BW via the Blackwall Tunnel.
- 4.3 Project Co shall ensure that each additional fibre link required pursuant to paragraph 4.2 shall:

- 4.3.1 be designed, installed and tested in accordance with ITU G.652 as described in Part 2 (*Design Standards and Specifications*) of Schedule 10 (*Design and Construction Requirements*);
- 4.3.2 include two (2) one hundred (100) millimetre diameter ducts along with draw pits, draw ropes and access points;
- 4.3.3 in relation to each of Additional Fibre 1 and Additional Fibre 2:
 - a. consist of one cable per duct;
 - b. have at least forty eight (48) cores in each cable;
 - c. use single-mode fibre in each cable; and
 - d. terminate each cable on an optical distribution frame.
- 4.3.4 where such additional fibre link runs through the tunnels, have the cables for such additional fibre link routed through separate tunnel bores;
- 4.3.5 where such additional fibre link runs along roads or elsewhere, have the cables for such additional fibre link routed through separate ducts; and
- 4.3.6 in the case of failure or for any other reason whatsoever, not impact upon Project Co's ability to perform the Services or to make the Project Roads available for public use.
- 4.4 Project Co shall ensure that the Design Data relating to the TfL Cables submitted to TfL under the Review Procedure shall include, but not be limited to, the following:
 - 4.4.1 the physical routing of any fibre and all associated equipment; and
 - 4.4.2 the specification for any proposed fibre and all associated equipment.
- 5. TfL Equipment Spaces**
- 5.1 Project Co shall design and construct the equipment spaces required pursuant to this paragraph 5 (*TfL Equipment Spaces*) for TfL's sole use.
- 5.2 Project Co shall provide equipment spaces in the:
 - 5.2.1 tunnel service building on the north side of the river constructed pursuant to paragraph 9 of Annex 3 (*Structures Requirements*) of Part 1 (*Design and Construction Requirements*) of Schedule 10 (*Design and Construction Requirements*)(the "**TfL Equipment Space North**"); and
 - 5.2.2 tunnel service building on the south side of the river constructed pursuant to paragraph 9 of Annex 3 (*Structures Requirements*) of Part 1 (*Design and Construction Requirements*) of Schedule 10 (*Design and Construction Requirements*) (the "**TfL Equipment Space South**"),together (the "**TfL Equipment Spaces**").
- 5.3 Project Co shall not be permitted to install any equipment within the TfL Equipment Spaces other than as required by this Schedule 11 (*TfL Technology Requirements*).

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- 5.4 Project Co shall ensure that the TfL Equipment Spaces shall:
- 5.4.1 incorporate environmental controls which shall be capable of ensuring that the temperature within the TfL Equipment Spaces is kept within the range of fifteen (15) degrees centigrade to thirty two (32) degrees centigrade at all times;
 - 5.4.2 incorporate environmental controls which shall be capable of ensuring that the relative humidity within the TfL Equipment Spaces is kept within the range of twenty five (25) per cent to sixty (60) per cent at all times;
 - 5.4.3 be designed and installed such that additional communications links can be installed without structural changes to the TfL Equipment Spaces or disruption to the Services;
 - 5.4.4 have power provided by the uninterrupted power supply required pursuant to paragraph 10 (*Tunnel electrical power supply and distribution system*) of Annex 2 (*Requirements for Tunnel ME&P Systems*) of Part 1 (*Design and Construction Requirements*) of Schedule 10 (*Design and Construction Requirements*) in the event of power failure;
 - 5.4.5 be secure in accordance with "Secured by Design" as referenced in Annex 3 (*Structure Requirements*) of Part 1 (*Design and Construction Requirements*) of Schedule 10 (*Design and Construction Requirements*);
 - 5.4.6 be physically secure with access controlled, logged and permitted only to persons authorised by TfL; and
 - 5.4.7 be accessible (to authorised persons only) at all times with no impact on the road network or the performance of the Services.
- 5.5 Project Co shall provide rack cabinets within each TfL Equipment Space in accordance with the following requirements:
- 5.5.1 four (4) nineteen (19) inch cabinets shall be provided in the TfL Equipment Space North;
 - 5.5.2 eight (8) nineteen (19) inch cabinets shall be provided in the TfL Equipment Space South;
 - 5.5.3 each cabinet shall be at least 42U tall;
 - 5.5.4 each cabinet shall have front and rear doors which shall be capable of being simultaneously fully opened following installation;
 - 5.5.5 each set of cabinet doors shall be lockable;
 - 5.5.6 each cabinet shall have removable side panels;
 - 5.5.7 each cabinet shall have dual independent diverse supplies;
 - 5.5.8 each cabinet shall have at least sixteen (16) fully functional BS1363 sockets per supply;
 - 5.5.9 a supply change over device (transfer switch) shall be fitted to support 4 (four) BS1363 devices to each cabinet;

5.5.10 seven point five (7.5) kilowatts shall be provided per cabinet; and

5.5.11 patch panels shall be provided in each cabinet, which shall provide at least 24 (twenty four) ports to make inter-cabinet connections and to connect all IP links to the cabinets,

(the "**TfL Rack Cabinets**").

5.6 Project Co shall attach identifying visual markers such that it is possible to visually identify to which power supply any socket within a TfL Equipment Space is connected.

5.7 Project Co may provide separate 'meet-me' rooms within or adjacent to the TfL Equipment Spaces.

5.8 Project Co shall ensure that the Design Data relating to the TfL Equipment Spaces submitted to TfL under the Review Procedure shall include, but not be limited to, the following :

5.8.1 the physical routing of any cables, fibre and all associated equipment; and

5.8.2 the specification for any proposed cables, fibre and all associated equipment.

6. Compliance and Interoperability Testing

6.1 Project Co shall:

6.1.1 provide all resources, knowledge and access reasonably required by TfL and any TfL Related Party to enable TfL to test the interoperability of the Project Co TCS, TfL TCS and associated networks and systems;

6.1.2 ensure that the Project Co TCS shall not adversely impact the TfL TCS or the LTRACS Network and prior to making any live connections carry out any testing reasonably required to ensure that the Project Co TCS shall not adversely impact the TfL TCS or the LTRACS Network; and

6.1.3 at least eighteen (18) months prior to the Permit to Use Date, submit a test plan to TfL pursuant to the Review Procedure (the "**Project Co Test Plan**").

6.2 Project Co shall ensure that the Project Co Test Plan shall:

6.2.1 detail how Project Co proposes to demonstrate the functionality and interoperability of the Project Co TCS, TfL TCS and associated networks and systems, to satisfy the requirements of this Schedule 11 (*TfL Technology Requirements*) and the provisions of this Agreement;

6.2.2 demonstrate how any works in relation to the TfL TCS, LTRACS Network and any other TfL networks and systems will not compromise the continued functionality of those networks and systems;

6.2.3 provide a process for resolving faults and interoperability issues in the Project Co TCS, the TfL TCS and associated networks and systems;

6.2.4 detail any actions required to undertake the Project Co Test Plan; and

6.2.5 include arrangements for any retests required by the Project Co Test Plan.

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- 6.3 At least twelve (12) months prior to the Permit to Use Date, Project Co shall implement and manage the execution of the Project Co Test Plan, which is endorsed as "received" or "received with comments" by TfL pursuant to the Review Procedure, to demonstrate compliance and interoperability of the Project Co TCS, TfL TCS and associated networks and systems.
- 6.4 Project Co shall notify TfL when all compliance and interoperability testing is complete in accordance with the Project Co Test Plan and provide to TfL all information necessary to demonstrate the same.
- 6.5 Once Project Co has demonstrated to the reasonable satisfaction of TfL that the Project Co Test Plan has been completed, TfL shall, within twenty (20) Working Days, issue a certificate confirming successful completion of the Project Co Test Plan.

7. Documentation

- 7.1 Project Co shall provide to TfL documentation relating to Additional Fibre 1, Additional Fibre 3 Ducting, the LTRACS Rerouting and the TfL Rack Cabinets, including but not limited to:
- 7.1.1 warranty details;
 - 7.1.2 details of the ownership and responsibilities for all equipment;
 - 7.1.3 connection schedules detailing the physical communication links and logical links between the Project Co TCS and TfL POPs; and
 - 7.1.4 final documentation of all interfaces between the Project Co TCS and tunnel equipment and the TfL TCS.
- 7.2 Project Co shall prepare and obtain TfL's written consent to reciprocal maintenance and access procedures between Project Co and TfL and any TfL Related Party to allow TfL or any TfL Related Party to access the Project Facilities in accordance with this Schedule 11 (*TfL Technology Requirements*).

SCHEDULE 11

TFL TECHNOLOGY REQUIREMENTS

Part 2 - TfL Technology O&M Requirements

- 1.1 For the duration of the Availability Period, Project Co shall:
- 1.1.1 maintain the Peering Links between the Project Co TCS and TfL TCS;
 - 1.1.2 maintain Additional Fibre 2;
 - 1.1.3 provide TfL or any TfL Related Party with all access reasonably required to maintain, connect to or otherwise access:
 - a. Additional Fibre 1;
 - b. Additional Fibre 3 Ducting;
 - c. the LTRACS Rerouting;
 - d. the LTRACS Network; and
 - e. the TfL Rack Cabinets,and Project Co shall ensure that any such maintenance, connection or access can be carried out without any impact on the Project Roads or the Services;
 - 1.1.4 maintain the structure and environment of the TfL Equipment Spaces and ensure that the TfL Equipment Spaces comply at all times with the requirements set out in paragraph 5.4 of Part 1 (*TfL Technology D&C Requirements*);
 - 1.1.5 not alter or amend the protocol for priority of control of devices without TfL's prior written consent;
 - 1.1.6 not alter or amend the Project Co TCS or the interface between the Project Co TCS and the TfL TCS without TfL's prior written consent and Project Co shall reimburse TfL for the reasonably incurred costs of altering or amending the TfL TCS to reflect any alterations or amendments to the Project Co TCS;
 - 1.1.7 alter or amend the Project Co TCS and the interface between the Project Co TCS and the TfL TCS to reflect any changes to the TfL TCS as TfL may reasonably request from time to time and such matters shall be instructed as a TfL Change pursuant to Part 1 (*TfL Changes*) of Schedule 22 (*Change Procedure*);
 - 1.1.8 if TfL has provided consent pursuant to paragraph 1.1.6, submit updated documentation for all interfaces between the Project Co TCS and the Project Facilities and between the Project Co TCS and the TfL TCS to TfL within five (5) Working Days of any alterations or amendments; and
 - 1.1.9 if TfL has provided consent pursuant to paragraph 1.1.6, submit documentation for any changes to the Project Co TCS or subsystems or systems controlled by the Project Co TCS to TfL within five (5) Working Days of any alterations or amendments.

- 1.2 Without prejudice to clause 20.2.(e), Project Co shall not be required to maintain:
- 1.2.1 Additional Fibre 1;
 - 1.2.2 Additional Fibre 3 Ducting;
 - 1.2.3 the LTRACS Rerouting;
 - 1.2.4 the LTRACS Network; and
 - 1.2.5 the TfL Rack Cabinets.

SCHEDULE 11

TFL TECHNOLOGY REQUIREMENTS

Part 3 - Definitions

For the purposes of this Schedule 11 (*TfL Technology Requirements*) unless the context otherwise requires, the following words and expressions shall have the following meanings:

"Additional Fibre 1" has the meaning given to it in paragraph 4.2.1 of Part 1 (*TfL Technology D&C Requirements*);

"Additional Fibre 2" has the meaning given to it in paragraph 4.2.2 of Part 1 (*TfL Technology D&C Requirements*);

"Additional Fibre 3" has the meaning given to it in paragraph 4.2.3 of Part 1 (*TfL Technology D&C Requirements*);

"API" means an application programme interface;

"Core Node" means a router or network device contained within a POP;

"Cyber Security Requirements" means the requirements relating to cyber security set out in Annex 2 (*Information Security*) of Part 5 (*Information Management*) of Schedule 8 (*Management Systems*);

"Horus" means a platform provided by Indra Systems;

"ICMP" means an internet control message protocol;

"IP" means an internet protocol;

"LTRACS Network" means the traffic control and communications network operated by TfL in relation to its tunnels and associated traffic;

"LTRACS Rerouting " has the meaning given to it in paragraph 3.2 of Part 1 (*TfL Technology D&C Requirements*);

"NSP" means an entity that provides or sells services such as network access and bandwidth by allowing access into its backbone infrastructure or access to its network access points through Core Nodes;

"Peering Link" means a fibre IP link connecting a Core Node to a TCS;

"POP BW" means the access point where connection to the TfL network can be made located at Blackwall Tunnel Blast Room;

"POP EIDL" means the access point where connection to the TfL network can be made located at the East India Dock Link Tunnel Service Building;

"Resilient" means a system or network that is able to provide and maintain an acceptable level of service in the face of faults and challenges to normal operation;

"TfL Cables" means Additional Fibre 1, Additional Fibre 2, Additional Fibre 3 Ducting and all associated equipment and installations;

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"TfL Equipment Space North" has the meaning given to it in paragraph 5.2.1 of Part 1 (*TfL Technology D&C Requirements*) of Schedule 11 (*TfL Technology Requirements*);

"TfL Equipment Space South" has the meaning given to it in paragraph 5.2.2 of Part 1 (*TfL Technology D&C Requirements*) of Schedule 11 (*TfL Technology Requirements*);

"TfL Equipment Spaces" means the TfL Equipment Space North and the TfL Equipment Space South;

"TfL Rack Cabinets" has the meaning given to it in paragraph 5.5 of Part 1 (*TfL Technology D&C Requirements*) of Schedule 11 (*TfL Technology Requirements*).