A303 Amesbury to Berwick Down (Stonehenge)

Invitation to Participate in Dialogue

Quality Submission Template C

Outline Asset Management Forward Plan

TEMPLATE C – Outline Asset Management Forward Plan	
Participant allocated name	Badger
Submission version	Final
Submission date	30th July 2021

1. Asset Management Strategy

The Asset Management Strategy will be based on the effective management and use of intelligence gained from all data collated during Design and Construction and the Maintenance Period, and the implementation of BADGER's Inspection Strategy.

1.1. Summary for each Asset Category

1.1.1. Implementing Effective Asset Management

For each asset category, data will be collected through a documented regime and framework of integrated activities based on a hierarchy of integrated processes. BADGER's Asset Management strategy will bring benefits to Highways England and the end users by optimal management of physical assets, providing the definition of good practice in the 'Whole Life' management of assets and a critical factor in delivering the required service.

1.1.2. Whole Life Strategy for Individual Assets

'Whole life' asset management strategies will be developed for each asset type and sub-type during the early design stages; this will ensure that whole life decision making is embedded in the optimisation of design elements to produce the optimum solution.

The Asset Management Whole Life Strategy Process is illustrated in Figure 1-1. BADGER's Whole Life Strategy will be based on lowest economic cost impact, meaning that, 'the strategy selection will be based upon the lowest Net Present Value (NPV) or Whole Life cost.

BADGER's Whole Life Principles will be as follows:

- Safety;
- Availability of Affected Property;
- Whole life cost; &
- Environment.

BADGER will develop a multi-criteria analysis framework aligned to these principles and Highways England's objectives to embed a Value Management process into the management strategy for each asset and sub-asset type.

By incorporating a rigorous review and revise step into the process we will ensure that the requirements of Highways England are met, and the effects of changing user demands and benefits from evolving technology are fully understood and utilised throughout the lifecycle of the project.

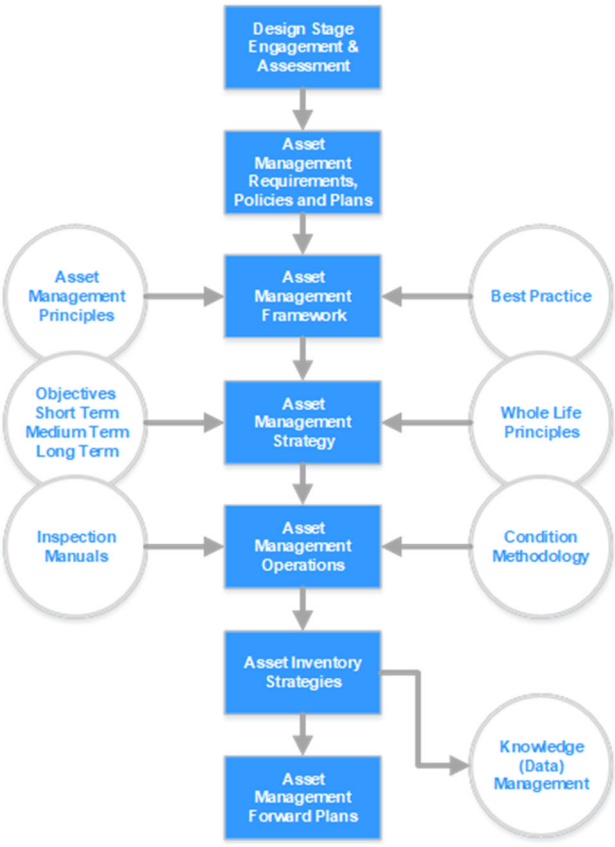


Figure 1-1: Whole Life Strategy Process

Risk Based Approach

BADGER will utilise a risk-based approach to asset management in accordance with ISO55000 and the principles of the Well-Managed Highway Infrastructure Code of Practice. Whilst a risk-based approach is not risk management, it aligns with ISO31000 and Highways England's Risk Management processes to shape asset management decisions. This approach will be a fundamental part of

maintenance and renewals throughout the lifecycle of assets and minimise the impacts of asset defects on road users.

Adoption of a risk-based approach will be integrated into tasks such as safety and condition inspections, maintenance activity, network resilience assessment, prioritisation of repairs and programming of work, as detailed elsewhere in this Asset Management Forward Plan.

1.1.3. Asset Management Embedment and Continuous Improvement

BADGER seeks to make effective decisions about when to maintain the Affected Property including all tunnel and associated infrastructure assets. This will be achieved by acquiring appropriate knowledge of asset performance and having appropriately trained staff using that knowledge within robust processes and procedures. We will also foster innovation and proactively encourage the use of new techniques for performance monitoring and data analysis.

1.1.4. Knowledge Sharing

It will be important to ensure appropriate information and knowledge sharing within the evolving team. To maximise continuity, members of the asset management team will be appointed for the long-term and providing a culture of continual improvement on A303 asset information and knowledge. All roles within the team will be clearly defined. A successor to each position will be identified, thus ensuring there will be a smooth hand-over of responsibility well before the incumbent member of staff leaves or retires.

1.1.5. Benchmarking

BADGER will establish and maintain leadership by benchmarking our performance against a wide range of comparators. These will include leading asset management organisations within the tunnel, bridge and highways sector, across the UK industry and worldwide, drawing on our international experience and contacts.

On an annual basis, BADGER will seek to benchmark against the other tunnels operated and maintained by Highways England, through cooperation with Highways England, other DBFO concessions operated and maintained by our consortia members and the Road Tunnel Association and other industry bodies.

1.1.6. Identifying and adopting improvement initiatives

BADGER will form a team that will promote good practice and develop new solutions and are committed to sharing the results of our efforts to achieve innovation and continual improvement.

We will encourage regular feedback from Highways England and other stakeholders on our performance, and approach management reviews wholly and collaboratively. BADGER senior team will meet with Highways England on a programmed monthly basis as a minimum.

The use of human factors management will assist us in understanding behaviours, and we will develop a human factors integration strategy for the project. This will identify the critical performance factors, the appropriate stakeholders and monitoring frequencies.

BADGER will invite Highways England and stakeholders to participate in best practice forums and training programmes. We will develop a community for those engaged with the tunnel, to share intelligence and a consensus on the approaches and methods to be adopted.

In addition, BADGER will develop a research programme which will include benchmarking exercises, best practice reviews and intelligence gathering on developments in technology. It will draw on market research, existing practises, including supply chain engagement and participation. Potential improvement initiatives will be summarised in our regular Report and Review for further discussion with stakeholders involved.

1.1.7. Data Management and Information Systems

BADGER will use appropriate tools and systems to support budget, maintenance and lifecycle management planning. Asset data, information and knowledge are key enablers to the delivery of an effective Asset Management approach. BADGER will adopt the principles of ISO 55000 and, to enable ease of access for BADGER and Highways England, we will establish a Common Data Environment (CDE) which will be used to capture and manage all relevant information in relationship to the works and services. This will commence in the design stage and the creation of the BIM model, enabling use of the captured knowledge during the operate and maintain stage.

This approach will facilitate a smooth transition from design and construction to operation phase and the information will be audited at various project stages to ensure it is current and ultimately contains 'as built' data.

The BADGER CDE is a key enabler in the establishment and use of the asset management system. It is central to the asset information systems and the sharing of information with Highways England.

Highways England will be the long-term asset owner therefore we will work with you to align our data capture and conventions to mirror your own through the Employers Information. This will facilitate the transfer of information at handover. This will involve Asset Data Quality Plans relevant to individual asset groups which will be needed to set out the proactive approach to the collection, recording and management of data and information. This process will be owned by the BADGER Operational Manager (or equivalent).

The strategy is for digital input at every data capture event. Digital forms, deployed on mobile devices such as tablets and web-based user interfaces, are designed to allow for error free, direct input of information. The Asset Management Strategy includes tailored, managed workflows to ensure traceable data validation following the ISO 19650 CDE process areas.

Digital forms are used to capture and document surveys, inspections and maintenance works. The forms are sent to a server system which automatically extracts the content (such as: location, date, photos, status etc.) out of the form and inserts the data into the project data store. Additionally, a pdf copy of the form is produced and loaded into the document section of the CDE (Electronic Document Management System [EDMS]) for future reference and distribution.

The data integration platform will permit the full integration and access to project information, the generation of reports on asset condition, deterioration, level of service, etc., interactive dashboards and linked 3D models. The reporting element is important for Highways England in accessing and assessing unavailability and service shortfall deductions.

The BADGER proposed Asset Management System will contain all the project data from design to handover. The benefit of this system is the CDE which eliminates all data handover interfaces. The CDE will be accessible to Highways England and will be managed so that information flow meets Highways England's Data Exchange File Formats. There are no licence issues related to CDE for the handover and import of information into Highways England's Asset Management Strategy.

All data in the CDE will be backed up in accordance with the data management and security procedures as developed by BADGER in accordance with our Management Systems and the Asset Management System.

In further developing the Asset Management Strategy, BADGER will utilise advances in machine learning, AI (Artificial Intelligent) and Virtual Reality and apply it to scheduling, change orders, site staff costs, etc. This will assist BADGER to predict and react faster to inefficiencies on the project facilities which will lead to significant opportunity for savings. In addition, BADGER will, where possible, automate tasks with a view to eliminating human error.

There would also be a simple to use user interface where project teams can visualise different aspects of the project in real time. Importantly the asset information management process will commence at the design stage, carry on in the construction stage and be added to in the O&M stage; providing a full BIM approach over the life of the project.

1.2. Asset Management Strategy for each Asset Category

BADGER's outline asset management strategy for each asset category is presented in Table 1-2.

1.3. Asset Maintenance Activities

The asset maintenance activities will be defined by asset type and sub-asset type based on the asset management strategies in Table 1-2. The template will be developed and revised as the design progresses and elements identified in the BIM model. The main asset groups are;

- Pavements and paved areas
- Road markings and road studs
- Road restraint systems
- Road traffic signs
- Structures
- Tunnel Structure
- M&E and technology
- Drainage and service ducts

Routine and cyclical maintenance will be carried out in accordance with the relevant standards as set out in Volume 2, Part 4 – Maintenance and operation Requirements, Annex 1 Inspections and Maintenance Standards or, where appropriate, to the designers or manufacturers recommendations.

1.4. Development of Maintenance Requirement Plans

BADGER's Maintenance Requirement Plans will be Confirmed as the design develops and ongoing Consultation with our supply chain. BADGER's initial approach to Maintenance Requirement Plans are presented in Section 5 of this document and are aligned to the Southwest Maintenance Requirements plan.

As the project progresses into operational maintenance, Maintenance Requirement Plans will be developed in accordance with Asset Delivery Asset Maintenance requirements (ADAMr) including all the detailed manufactures maintenance and operation instructions and recommendations for all maintenance frequencies.

BADGER's initial approach to Maintenance Requirement Plans will be Consistent with CM 430 Maintenance of Road Tunnels and CM452 Inspection and Records for Road Tunnels. BADGER will aim to evenly distribute planned maintenance activities to utilise planned tunnel closures and develop rolling programmes that take into Consideration equipment renewals timeframes e.g., pumping equipment.

As well as Maintenance Requirement Plans for the Affected Property, BADGER will develop Maintenance Requirement Plans for the Tunnel services building and M&E, IT equipment held within it as required.

BADGER will prepare the Maintenance Requirement Plans, for approved by the Tunnel Manager.

The Maintenance Requirement Plans will be established together with BADGER's planned closures prior to the opening of A303. BADGER's initial Maintenance Requirement Plans will be reviewed on annually basis and varied in accordance to actual experience and feedback from BADGER's Inspection programme. BADGER will submit Copies of the Maintenance Requirement Plans to Highways England as part of the Annual Programme. Progress will be included in the Monthly Operations and Maintenance Report.

Maintenance Requirement Plans will also consider equipment manufacturers' recommendations for specified time intervals. For specific equipment we will have service level agreements with the manufacture or installer to provide maintenance activities.

Tunnel cleaning and washing activities will be described in the Cleaning, Sweeping and Washing Plan. These activities are included in the annual, 5-year and 25-year Forward Plan.

Routine Maintenance of the tunnel structure will be included in a planned structures maintenance programme Complying with DMRB CM430 Maintenance of Road Tunnels and the OMM including:

- Graffiti removal
- Debris removal from joint seals
- Repairs to movement joints
- Clean bearing shelves
- Tunnel cladding
- Structural Concrete minor repairs
- Expansion joint
- Drainage Sump structures

Ventilation Systems will be cleaned, inspected, tested and maintained in accordance with the manufactures recommendations. For increased lifetime expectancy, the fans are constructed from Galvanised Steel. The Fan Casing will have a minimum protection of 85 microns and the Silencers will have a minimum protection of 45 microns. The service life of the fans in C3 Environment conditions would be 22 years.

Lighting Systems will be cleaned, inspected, tested and maintained in accordance with the manufactures recommendations. Lighting fixtures are not expected to run 100% output, for A303 tunnel fixtures will be run at 30%. This is expected to significantly increase the lifetime up to 26 years. This will not benefit the drivers which will still require to be refurbished after 12 years **(TQ4A.2),** Led by our Maintenance Lead and Construction Tunnel Manager

Fire Safety Equipment: Automatic fire extinguishers, gas detectors, fire detection equipment tested by competent staff that will be selected by our supplier approval process.

BADGER are investigating the possibility of adopting remote – condition monitoring for, but not limited to, the ventilation and lighting systems.

BADGER is also investigating the possibility of implementing digital image recording during safety patrols.

BADGER propose for tunnel scanning using a vehicle mounted camera system which can operate in the tunnel without the need for tunnel closure and will contribute to predictive maintenance and the reduction of accidents in a tunnel. Decisions to the use of this machine will be made by our maintenance lead liaising and informing traffic management. (**TQ1B4.1, TQ2C3.3** and **TQ4A7** – these will be led and managed by our Construction Manager, HSW Manager and Maintenance Lead)

1.5. Lifecycle Renewals

BADGER's lifecycle approach will optimise the need for asset renewal. Initially, asset renewal will be designed out where possible. In accordance with the requirements above the annual programme will be reviewed and updated annually to include any necessary lifecycle renewals and the inspection and maintenance activities revised to reflect the creation of the renewed asset.

Table 1-1: Asset Management Strategy for Each Asset Category

Asset Cat. No.	Asset Category	Description of assets & infrastructure included	Refurbishment Cycle (Years)	Replacement Cycle (Years)	Asset Management Strategy
1	Pavements and paved areas, including kerbs and hard standing areas	The new eastbound & westbound A303 within the extents of the affected property	Surface Course: 14 - 17 years	>40 Years	The pavement will be designed as a long-life structure and with regular planned interventions to replace the upper layers the structure should last indefinitely. Planned surface course interventions would commence in year 14 and approx. 25% of the surfacing would be replaced each year between years 14 & 17. An allowance of 5% binder course replacement would also be included in this intervention to replace any damaged binder course. This will maintain the condition requirements set out in Volume 2, Part 4, Table A1-3.
		Longbarrow Jct.: north-east facing slip road, south-east facing slip road, north-west facing slip road & south-west facing slip road			
2	Road markings & studs	Carriageway markings within the extents of the affected property	14 - 17	14 - 17	Road markings and studs will be replaced at the same time as the surface course. This will maintain the condition requirements set out in Volume 2 Part 4 Table A2-4.
		Road studs within the extents of the affected property	14 - 17	14 - 17	
3	Road restraint systems	Verge side barriers within the extents of the affected property	Tighten or replace screws and bolts and re-tension barrier	30	The need for asset renewal has been largely designed out of these assets. Regular Planned Preventative Maintenance and Reactive Maintenance (e.g. tightening of bolts etc.) will be undertaken to maintain condition requirements set out in Volume 2 Part 4 Table A3-5.
		Traffic control barriers within the extents of the affected property			
		Crossover barriers			

Asset Cat. No.	Asset Category	Description of assets & infrastructure included	Refurbishment Cycle (Years)	Replacement Cycle (Years)	Asset Management Strategy
		Central reserve barrier within the extents of the affected property	60	60	The need for asset renewal has been largely designed out of these assets. Regular Planned Preventative Maintenance and Reactive Maintenance will be undertaken to maintain condition requirements set out in Volume 2 Part 4 Table A3-5.
4	Road traffic signs	Fixed traffic signs within the extents of the affected property	30	30	No planned replacement during the first 25 years. Regular Planned Preventative Maintenance and Reactive Maintenance to maintain the condition requirements set out in Volume 2 Part 4 Table A4-3.
5	Structures	Countess Roundabout Flyover (East and West)	Structure 120 years Noise Barrier 20 years	120	The need for asset renewal has been largely designed out of these assets as they have been designed as integral structures. As a result, there will be no need for joint replacement during their life. The only component requiring replacement will be the noise barrier on the countess roundabout flyover. This will maintain the condition requirements set out in Volume 2 Part 4 Tables A5-11 and 5-12.
		Longbarrow Junction (Green Bridge 3 and 4)	120	120	
		Countess Roundabout Flyover - Retaining Walls	120	120	The need for asset renewal has been largely designed out of these assets as they have been designed as integral structures. The soil nailed walls have been designed to require no maintenance over their 120-year design life and the concrete facing panels have been designed to have a service life of 50 years. This will maintain the condition requirements set out in Volume 2 Part 4 Tables A5-11 and 5-12.
		Western Tunnel Portal Approach North Retaining Walls	120	120	
		Longbarrow North & South Retaining Walls	120	120	
		Eastern Tunnel Portal Approach North & South Retaining Walls	120	120	
6	Tunnel structure	Eastern and western tunnel services buildings	50	50	The need for asset renewal has been largely designed out of these assets as they have been designed as integral structures. As a result, there will be no need for joint replacement during their life. This will maintain the condition requirements set out in Volume 2 Part 4 Tables A6-8 and 6-9.
		Bored tunnel	120	120	
		Cross passages	120	120	
		Eastern cut and cover tunnel section	120	120	
		Western cut and cover tunnel section	120	120	

Asset Cat. No.	Asset Category	Description of assets & infrastructure included	Refurbishment Cycle (Years)	Replacement Cycle (Years)	Asset Management Strategy
		All tunnel drainage infrastructure	60	60	The need for asset renewal has been largely designed out of these assets as they have a structural life of 60 years. Regular Planned Preventative Maintenance and Reactive Maintenance will be undertaken to maintain condition requirements set out in Volume 2 Part 4 Tables A8-3.
7	M&E and Technology	High-voltage (HV) electrical systems	10	30	Where possible asset renewal has been designed out and residual life assured in design. The Traffic control & monitoring equipment will be installed and maintained in accordance with TR1100. Where it hasn't been possible to design out the need for asset renewal, Regular Planned Preventative Maintenance and Reactive Maintenance will be undertaken to maintain condition requirements set out in Volume 2 Part 4 Tables A7-17 and 7-18.
		Low-voltage (LV) electrical systems	10	30	
		Mechanical & electrical (M&E) and technology related systems, controls, fixtures & fittings	-	12	
		Ventilation systems	5	22	
		Smoke & fire detection alarm systems	10	30	
		Firefighting & fixed firefighting suppression systems	10	30	
		Drainage pumps & systems*	10	30	
		Lighting systems	12	26	
		Tunnel services buildings systems	-	7	
		Tunnel control & management system	5	30	
		Variable message signs	13	30	
		Communications systems, including emergency and maintenance telephones	10	30	
		Power & communications cabling	10	30	
		CCTV & PA systems	7	15	
		Incident detection & management systems	10	30	

Asset Cat. No.	Asset Category	Description of assets & infrastructure included	Refurbishment Cycle (Years)	Replacement Cycle (Years)	Asset Management Strategy
		Speed control & enforcement systems*	10	25	
		Overheight vehicle detection systems*	10	25	
		Tunnel closure systems*	10	25	
		Speed limit indicators	10	25	
		Traffic monitoring and management systems*	10	25	
		Queue detection systems*	10	25	
		Weather monitoring systems*	10	25	
		Security and evacuation systems*	10	25	
		Cabinets and plinths	10	25	
		Technology systems* associated with the operation of the tunnel that extend beyond the extents	10	25	
		All sensors and asset performance monitoring and fault management technology and systems* provided as part of the *works*	-	10	
8	Drainage and service ducts	All drainage features outside the tunnel and within the extents of the Affected Property	Pipes, chambers & covers: 60 years Filter Drain Media: 30 years	60	The need for asset renewal has been largely designed out of these assets. Regular Planned Preventative Maintenance and Reactive Maintenance (e.g. removing sediment and debris etc.) will be undertaken to maintain condition requirements set out in Volume 2 Part 4 Tables A8-3.

** Including Plant and Materials*

2. Incident Response Strategy

Incident response will be provided in accordance with the Southwest Incident Response Plan as part of BADGER's maintenance services and will include:

- attending and assessing the condition of Assets following an incident;
- making safe of Assets following an incident; and
- undertaking all permanent repairs and renewals to the Assets following an incident.

During the Design and Construction Phase, the BADGER structure will be responsible for ensuring preparedness in relation to mobilisation responsibilities. These responsibilities will include required liaison with Emergency Services, Emergency Planning Groups and the Tunnel Design and Safety Consultations Group (TDSCG) in line with CD352.

Three months before the start of the Maintenance Period BADGER will submit an Incident Response Plan which will detail:

- the operational and interface protocols between BADGER, the Regional Operations Centre (ROC), Highways England, the nominated recovery and response service, emergency services and other stakeholders;
- the interface management and communications required to deploy temporary traffic management and the network occupancy following an incident;
- the command structure and protocols for decision making;
- response times following the notification of an incident;
- procedures for attending, assessing and making safe of Assets following the notification of an incident;
- the plant, equipment, personnel and materials that will be deployed in response to an incident;
- specific measures or procedures relating to each Asset Category;
- contingency procedures and measures which will be implemented in the event of failure of any action, decision or other measure; and
- engagement and participation in emergency exercises, including frequencies, activities and resource.

All BADGER incident responders will be fully skilled and trained to deal with incidents, respective to their operational, tactical or strategic level positions.

BADGER resources will be available, working alongside additional sub-contract resources. This is to provide additional mitigation for all system-based safety and response activities within the Affected Property during the Maintenance Period. All external resources will be employed on a service level agreement and a performance basis.

To support Highways England in incident management and clearance, following an incident BADGER's highly trained and multi-skilled resources will attend and assess asset condition, making safe and repairing or renewing assets where required. BADGER's internal resources, supported by an approved and skilled supply chain, will work closely with Highways England to secure the expeditious movement of traffic on or in the A303 road network and facilitate this on other authorities' road networks when required, restoring lane availability at the earliest opportunity.

BADGER will adopt a continuous improvement philosophy and will review each incident to determine where future improvements could be made with emphasis on procedures, processes and timescales.

2.1. Incident Related Training Activities

During the Maintenance Period BADGER will participate in four emergency exercises on an annual basis:

- Multi agency response to a major incident in the tunnel resulting in whole or partial closure;
- Snowdesk exercise to test and review the readiness of the tunnel operational and maintenance for severe weather response; and
- Other activities in accordance with CS 452, CM430 and PIARC Best Practice for road tunnel emergency exercises.

3. Traffic Management Strategy and Closure Programme

3.1. Traffic Management

During any incident, the provision of traffic management may be required. The use of both physical and non-physical or digital traffic management has the potential to be deployed within the A303.

Traffic management will be implemented by the following means:

- Non-physical traffic management will be instigated automatically by the Tunnel Operator from the incident detection system within the Tunnel Control System.
- Physical traffic management will be implemented by the BADGER Intervention Team.
- Wider implementation of strategic traffic management, outside BADGER operations and maintenance area will be implemented by Highways England's service provider.

Traffic Management may be required as part of:

- The design and installation of traffic management for planned and unplanned maintenance activities, in accordance with the Operational Requirements for Network Occupancy; and
- Provision of Traffic Management for incident management where instructed.

Traffic management implementation will be delivered in phases depending on the scale and criticality of any incident. Wherever possible, it is envisaged the use of technology and non-physical traffic management for minor incidents will be the primary option wherever possible. This is to reduce delay and congestion and maximise availability.

The primary point of contact for all communications in the event of an incident or emergency shall be the Regional Operations Centre (ROC). BADGER will immediately respond to, and comply with, any request by the ROC and Highways England, providing support in relation to any incident or emergency, including deployment of Temporary Traffic Management. This will be managed through the Routine Maintenance Manager, Tunnel Manager, the TSCO, and the Tunnel Control Centre.

In advance of any traffic management installation, BADGER TSCO will communicate in accordance with the Southwest ROC as soon as reasonably practicable ahead of the implementation of any required temporary traffic management measures. Coordination requirements will also be met in specific regard to Highways England, Related Parties and the Emergency Services.

Restoration to normality as soon as is safe and reasonable to do so is of paramount importance to BADGER and users of the Project Roads. Incident close out, including liaison with the Southwest ROC will be the key to minimising the impact on the wider SRN and local road networks and will support both implementation and stand down of any wider Traffic Management Plans such as use of local diversion routes.

To support the safety of the maintenance workers BADGER will deploy an automated cone laying machine. This will eliminate the need for a member of the workforce to be exposed to live traffic. The FALCON Automated Cone Laying Machine requires solo-operator shifts. This will be led by our Maintenance and traffic management leads and added to all relevant method statements and risk assessments. **(TQ1B1.1, TQ1B3.1)**

BADGER propose for tunnel scanning using a vehicle mounted camera system which can operate in the tunnel without the need for tunnel closure and will contribute to predictive maintenance and the reduction of accidents in a tunnel. Decisions to the use of this machine will be made by our maintenance lead liaising and informing traffic management. (**TQ1B4.1, TQ2C3.3** and **TQ4A7** – these TQs will be led and managed by our Construction Manager, HSW Manager and Maintenance Lead)

3.2. Network Occupancy Outline Planned Tunnel Closure Programme

The Operational Requirements for Network Occupancy shall be complied with for all required network occupancy and traffic management planned and activities.

BADGER's outline planned tunnel closure and full closure (outside of the tunnel) programme has been designed to take account of the network availability requirements in section 1.5 of Volume 2 Part 4 (Maintenance Period Requirements) of the contract. No planned maintenance activities will be undertaken during the embargo periods. Figure 3-1 shows a sample of the Indicative Tunnel Closure and Full Closure Programme for year 1 and year 5 is shown in Figure 3-2. These are based on the activities shown in Annual, and Five Year, Asset Management Plan in Tables 5-1 and 6-1 respectively.

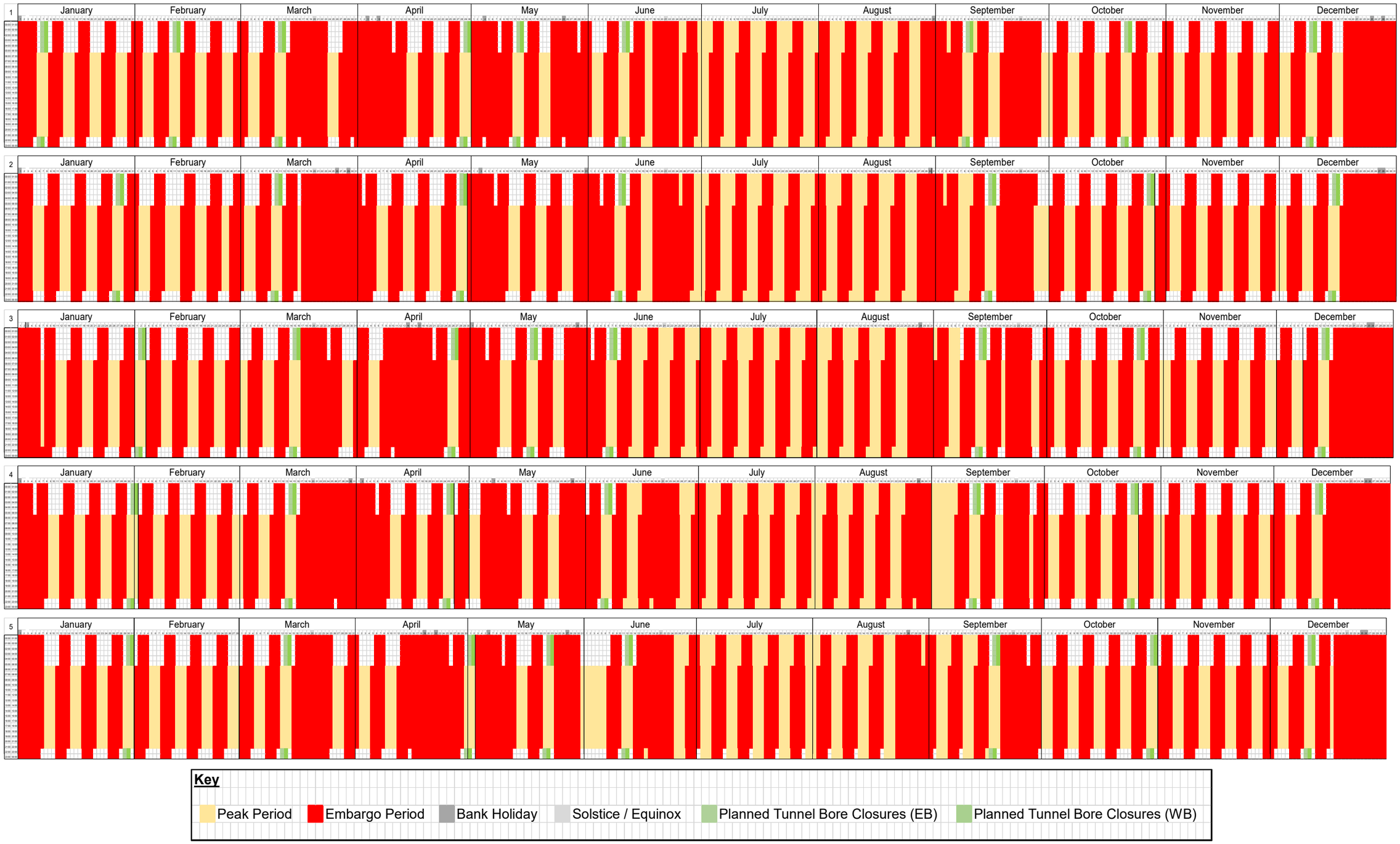


Figure 3-1: Indicative Tunnel Closure and Full Closures Programme – Years 1 to 5 (Assumed Year of Opening 2026)

4. Safety Patrol and Inspection Strategy

This section sets out the Annual Patrol, Inspections and Surveys Programme methodology to ensure the inspection of the A303 meets the requirements of Highways England Asset Delivery Asset Inspection requirements (ADAIr) during the maintenance period and facilitates the Handover process.

4.1. Purpose

BADGER will develop an Annual Programme template which will set out how BADGER will develop the Annual Programme during the Maintenance Period. This template will capture all the potential inspections within any Contract Year.

The Annual Programme demonstrates BADGER's understanding of the execution requirements for the various strategies and plans in any Contract Year and the coordination required to ensure maximisation of service delivery during the Maintenance Period.

4.2. Highways England's Requirements

Highways England has clearly set down the service they require throughout the Maintenance Period and the Handover. These are contained in Volume 2 – Scope Parts 3 and 4. The Annual Programme template will be developed to deliver the requirements of Highways England GG182; CS 452; CM 430 and PIARC Best Practice and will be further updated during the Design and Construction phase.

Annex 1 to Annex 8 of Volume 2 – Scope Part 4 defines Highways England's expectations in relation to the annual programme;

Prior to the Permit to Use Date, BADGER will:

- Prepare and submit to Highways England under the Review Procedure an Annual Programme for the first Contract Year of the Maintenance Period; and
- Ensure that Highways England has endorsed such plan as "received" or "received with comments" in accordance with the Review Procedure. No less than three (3) months prior to the start of each Contract Year (other than the First Contract Year in the Maintenance Period), BADGER will prepare and submit to Highways England under the Review Procedure an Annual Programme for the relevant Contract Year and will ensure that Highways England has endorsed such plan as "received" or "received with comments" in accordance with the Review Procedure.

Table 4-1 sets out how BADGER will ensure Annual Programmes will comply with the Project requirements:

Table 4-1: Annual Programme Requirements

Annual Programme requirements	
A	Be based on and developed from the draft set out in Annex 1 to 8 (Annual Programme) of Part 4 (BADGER Maintenance Period Requirements)
B	Be consistent with the latest Asset Management Strategy, Inspection Strategy, Lifecycle Renewals Plan; Five-Year Plan and 25-Year Plan which have been endorsed as "received" or "received with comments" by Highways England in accordance with the Review Procedure
C	Detail the types and programme of planned inspections and surveys to be performed in the relevant Contract Year
D	Detail all planned, preventative, routing, periodic and cyclical maintenance to be performed in the relevant Contract Year
E	Include all minor or major renewal or replacement works as may be required to be performed in the relevant Contract Year
F	Include all maintenance and operation activities required in the relevant Contract Year to comply with BADGER's obligations in Annexes 1 to 8 (Maintenance Period Requirements) and this Agreement

BADGER will ensure that the level of detail and description across activities and tasks included in the Annual Programme will be of consistent granularity.

BADGER may propose updates to the Annual Programme at any time (and will, in any event, review the Annual Programme not less than once every Contract Year during the Maintenance Period in accordance with Annexes 1 to 8) and will submit any proposed updates to the Annual Programme to Highways England under the Review Procedure.

BADGER will comply with each Annual Programme which has been endorsed as "received" or "received with comments" by Highways England pursuant to the Review Procedure and perform its obligations under this Agreement in accordance with such Annual Programme."

4.3. Inspection Activities

The Annual Inspection Programme template will be developed in accordance with the Project requirements and revised as applicable during the design and construction phase. A holistic approach will be taken to the planning and programming of all inspection activities to minimise the impact on the user and to maximise availability. This will include the use of technology e.g. 4k video surveys, drone surveys etc. that reduces the need for network occupancy. The annual programme will contain a description of the activities to be undertaken and whether they will compromise availability of the Affected Property.

BADGER regards the inspection regimes as a vital element in the maintenance and operation of the affected property. The data gathered enables informed decisions regarding future investment and programming to be made.

Safety patrols and inspections will be undertaken using a suitable method to ensure the network is safe and serviceable. A risk-based approach has been used to determine inspection frequencies in accordance with GS 801 Asset Delivery asset inspection requirements. The initial assessment of risk is that the A303 will be classed as high until a thorough understanding of the affected property and traffic levels in operation is available. Safety patrols will be carried out daily and safety inspections will be carried out weekly.

The inspection types and their identification codes are set out in Table 4-2 below.

Table 4-2: Inspection Types and Codes

Inspection Type	Inspection Code
Safety patrols	SP
Safety inspections	SaI
Visual condition inspections	VCI
Service inspections	SeI
Machine condition inspections - Scanner	Sca
Machine condition inspections - SCRIM	SCR
Machine condition inspections - Deflectograph	Def
Structures General Inspections	GI
Structures Principal Inspections	PI
Structures Special Inspections	SpI

5. Annual Asset Management Plan

Table 5-1: Annual Asset Management Plan

Location	Frequency	Asset Group	Description of Works	Month												Traffic Management	Plant & Equipment	Resource & Skills	Comments
				Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar				
				1	2	3	4	5	6	7	8	9	10	11	12				
Condition Inspection & Surveys Programme (including skills& resource and equipment requirements)																			
Lane 1, 2 & slips	Weekly	Pavements	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS229
Lane 1 and Lane 1 slips	Annually		TRACS survey		X												TRACS survey vehicle	Sub-contract to specialist supplier	In accordance with CS230
Lane 2 & Lane 2 slips	Year 1, 3 & 5				X												TRACS survey vehicle		In accordance with CS230
Lane 1 & Lane 1 slips	Annually		Skid Resistance Survey			X											SCRIM survey vehicle		In accordance with CS228
Lane 2 & Lane 2 slips	Year 1, 3 & 5					X											SCRIM survey vehicle		In accordance with CS228
Lane 1, 2 & slips	Year 1, 3 & 5		Video/Visual Survey				X										Traffic speed using van mounted 4K imaging equipment	Experienced highway engineers	In accordance with CS227
Road Markings & Road Studs	Weekly	Road Markings and Road Studs	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Impact Protection Vehicle	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS126
Road markings	1 day-time inspection every 12 months		Visual inspection	X													A vehicle mounted devices	Experienced road marking inspector & driver	In accordance with CS126
Road studs				X															
Road markings	1 night-time inspection every 12 months			X															
Road studs				X															
Road Restraint Systems (RRS)	Weekly	Road Restraint Systems	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CD 377
Steel RRS	Every six (6) months		General Inspections	X						X							Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced RRS Inspector & driver	In accordance with CD 377
Concrete RRS				X						X									
S-A-B Gate & Movable RRS	Annually		Detailed Inspection						X						X	Off-peak Full Closures	TM crew & handheld device (i.e. tablet)	Highway inspector with specialist experience and knowledge of restraint systems	In accordance with manufacturers requirements (6 & 12 months after installation, then annually)
Road Traffic Signs (RTS)	Weekly	Road Traffic Signs	Safety inspection	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS125
RTS	Annually		General Inspection	X													Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Traffic sign Inspector & driver	In accordance with CS125
Sign face & fixings, Posts & Lighting units			Principal Inspection		X											Off Peak Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with CS125
Electrical or mechanical testing	Year 1 & 5 of Maintenance Period				X												TM crew & handheld device (i.e. tablet)		In accordance with BS 7671
Retro-reflectivity	Annually (10%)			10%												Impact Protection Vehicle	Calibrated handheld retro reflectometer		In accordance with CS125
All Highway Structures	Weekly	Structures	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Drone survey or binoculars / camera	Trained Structures Inspector	In accordance with CS450
Large culverts	Year 1 & 5 of Maintenance Period 6 yearly thereafter		Principal inspection		X											Off Peak Full Closures	TM crew, handheld device (i.e. tablet), hammer, tapping, thickness measurement device and camera		In accordance with CS450
Bridge				X												Off-peak Full Closures			In accordance with CS450
Small culvert or small span structure				X															In accordance with CS450
Retaining wall				X															In accordance with CS 450

A303 Amesbury to Berwick Down (Stonehenge)

Template C – Outline Asset Management Forward Plan

Location	Frequency	Asset Group	Description of Works	Month												Traffic Management	Plant & Equipment	Resource & Skills	Comments
				Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar				
				1	2	3	4	5	6	7	8	9	10	11	12				
Sign/signal gantry				X												Off-peak Full Closures		Trained Structures Inspector	In accordance with CS450
Underpasses				X															In accordance with CS450
High mast				X															In accordance with CS450
Tunnel Structure	Weekly	Tunnel Structure	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Impact Protection Vehicle	Slow moving vehicle	Experienced Highways Inspector & driver	In accordance with CS452 and CS450
Tunnel structure eastbound	Year 1 & 5 of Maintenance Period then every 6 years		Principal Inspection							X						Off Peak Single Bore closures	TM crew & handheld device (i.e. tablet)	Experienced tunnel staffs	In accordance with CS452 and CS450
Tunnel structure westbound			Principal Inspection							X									In accordance with CS452 and CS450
M&E & Technology	Weekly	M&E and Technology	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS452
Ventilation	Year 1, 3 & 5 and 3 yearly thereafter		Principal Inspection	X												Off Peak Single Bore closures	TM crew & Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CS452 and CM430
Lighting					X												TM crew & Lifting platforms		In accordance with CS452
Drainage/sumps						X											TM crew & Gully cleansing vehicle		In accordance with CS452
Fire safety									X								TM crew & Safety inspection devices		In accordance with CS452
Communications & traffic controls										X							TM crew & Lifting platforms		In accordance with CS452
Plant control												X				Not Required	TM crew & Handheld mounted devices		In accordance with CS452
Electrical power													X			Off Peak Single Bore closures	TM crew & Electrical Power testing devices		In accordance with CS452
Building services														X		Not Required	Handheld device (i.e. tablet)		In accordance with CS452
All Drainage Asset	Weekly	Drainage	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	This inspection is undertaken to address risks posed by the assets to the road network. In accordance with CS551
Pipes & Chambers	Year 1 & 5 & 10% a year thereafter		Visual inspection						X							Off peak Full Closures	TM crew & Inspection Camera System/ laser profiler	Senior inspector with at least five years' experience	In accordance with CS551
Ditches and channels	Year 1 & 5 & 20% a year thereafter		Visual inspection						X								TM crew & handheld device (i.e. tablet)		In accordance with CS551
Ponds	Year 1, 3 & 5 then every 2 years		Visual inspection						X							Off peak Full Closures	TM crew & Inspection Camera System/ laser profiler		In accordance with CS551
Inlets and outlets & Ancillary drainage items	Annually		Visual inspection						X							Off peak Full Closures			In accordance with CS551
Filter drains			Visual inspection	X												Not Required	TM crew &Inspection Camera System		In accordance with CS551
Maintenance Programme (including skills& resource and equipment requirements)																			
All pavements assets	Annually	Pavements	Sweeping and cleaning	X												Impact Protection Vehicle	Sweeping vehicle	Highway Maintenance staff	Sweeping and cleaning. In accordance with GM 701
Chambers pipes & linear assets	First year	Drainage	Emptying and cleaning	X												Impact Protection Vehicle.	Gully emptying machine	Trained drainage maintenance staff	Sediments and debris will be removed from drainage system of affected properties.
Highway Structures	Annually	Structures	Minor or routine maintenance						X							Impact Protection Vehicle	Slow moving vehicle	Structures Inspector/Engineer	Includes repainting & removing vegetation. In accordance with CG302

Location	Frequency	Asset Group	Description of Works	Month												Traffic Management	Plant & Equipment	Resource & Skills	Comments
				Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar				
				1	2	3	4	5	6	7	8	9	10	11	12				
Tunnel Structures	4 times per year	Tunnel Structures	Surface washing	X			X				X				X	Off Peak Single Bore closures	TM crew & lifting platforms low pressure jetting unit	Tunnel operational & maintenance staff	In accordance with CM430
Asset Lifecycle Programme (including skills& resource and equipment requirements)																			
No works required in year 1																			

6. Five-Year Asset Management Plan

Table 6-1: Five Year Asset Management Plan

Location	Frequency	Asset Group	Description of Works	Year					Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5				
Condition Inspection & Surveys Programme (including skills& resource and equipment requirements)												
Lane 1, 2 & slips	Weekly	Pavements	Safety Inspection	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS229
Lane 1 & Lane 1 slips	Annually		TRACS survey	X	X	X	X	X		TRACS survey vehicle	Sub-contract to specialist supplier	In accordance with CS230
Lane 2 & Lane 2 slips	Year 1, 3 & 5			X		X		X				In accordance with CS230
Lane 1 & Lane 1 slips	Annually		Skid Resistance Survey	X	X	X	X	X		SCRIM Survey Devices		In accordance with CS228
Lane 2 & Lane 2 slips	Year 1, 3 & 5			X		X		X				In accordance with CS228
Lane 1, & 2 and slips	Year 1 & 5		Video/Visual Survey	X				X		Traffic speed using 4K imaging equipment	Experienced highway engineers	In accordance with CS227
Road Markings & Road Studs	Weekly	Road Markings and Road Studs	Safety Inspection	X	X	X	X	X	Impact Protection Vehicle	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS126
Road markings	1 day-time inspection every 12 months		Visual inspection	X	X	X	X	X		A vehicle mounted devices	Experienced road marking inspector & driver	In accordance with CS126
Road studs				X	X	X	X	X				In accordance with CS126
Road markings	1 night-time inspection every 12 months			X	X	X	X	X				In accordance with CS126
Road studs				X	X	X	X	X				In accordance with CS126
Road Restraint Systems (RRS)	Weekly	Road Restraint Systems	Safety Inspection	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CD 377
Steel RRS	Every 6 months		General Inspections	X	X	X	X	X		Vehicle mounted devices	Highway inspector with specialist experience and knowledge of restraint systems	In accordance with CD 377
Concrete RRS	Every 6 months			X	X	X	X	X		Vehicle mounted devices		In accordance with CD 377
Steel road RRS	Year 2 & 4		Detailed Inspections		X		X		Off-peak Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with CD 377
Concrete RRS	Year 2 & 4				X		X					In accordance with CD 377
S-A-B Gate & Movable RRS	Annually		Detailed Inspection	X	X	X	X	X				In accordance with manufacturers requirements (6 & 12 months after installation, then annually)
Road Traffic Signs (RTS)	Weekly	Road Traffic Signs	Safety inspection	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS125
RTS	Annually		General Inspection	X	X	X	X	X	Not Required	Vehicle mounted devices	Experienced Traffic sign Inspector & driver	In accordance with CS125
Sign face and fixings, Posts and Lighting units	Annually		Principal Inspection	X	X	X	X	X	Off-peak Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with CS125
Electrical or mechanical testing	Year 1 & 5			X				X	Off-peak Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with BS 7671
Retro-reflectivity	Annually (10% of Assets)			10%	10%	10%	10%	10%	Impact Protection Vehicle	Calibrated handheld retro reflectometer		In accordance with CS125
All Highway Structures	Weekly	Structures	Safety Inspection	X	X	X	X	X	Not Required	Drone survey or binoculars / camera	Trained highway safety inspector	In accordance with CS450
Large culverts	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping,	Structures Inspector/Engineer	In accordance with CS450
Large culverts	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450

Location	Frequency	Asset Group	Description of Works	Year					Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5				
										thickness measurement device and camera		
Bridge	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping, thickness measurement device and camera	Structures Inspector/Engineer	In accordance with CS450
Bridge	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450
Small culvert or small span structure	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping, thickness measurement device and camera	Structures Inspector/Engineer	In accordance with CS450
Small culvert or small span structure	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450
Retaining wall	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping, thickness measurement device and camera	Structures Inspector/Engineer	In accordance with CS450
Retaining wall	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450
Underpasses	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping, thickness measurement device and camera	Structures Inspector/Engineer	In accordance with CS450
Underpasses	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450
Sign/signal gantry	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping, thickness measurement device and camera	Structures Inspector/Engineer	In accordance with CS450
Sign/signal gantry	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450
High mast	Year 3		General inspection			X			Not Required	TM crew, handheld device (i.e. tablet), hammer, tapping & thickness tapping, thickness measurement device and camera	Structures Inspector/Engineer	In accordance with CS450
High mast	Year 1 & 5		Principal inspection	X				X	Off Peak Full Closures			In accordance with CS450
All Tunnel Structure	Weekly	Tunnel Structure	Safety Inspection	X	X	X	X	X	Impact Protection Vehicle	Slow moving vehicle	Experienced Highways Inspector & driver	In accordance with CS452 and CS450
Tunnel structure eastbound	Year 3		General Inspection			X			Off Peak Single Bore closures	TM crew & handheld device (i.e. tablet)	Trained tunnel staffs	In accordance with CS452 and CS450
Tunnel structure westbound	Year 3					X						In accordance with CS452 and CS450
Tunnel structure eastbound	Year 1 & 5		Principal Inspection	X				X		TM crew & handheld device (i.e. tablet)	Trained tunnel staffs	In accordance with CS452 and CS450
Tunnel structure westbound	Year 1 & 5			X				X				In accordance with CS452 and CS450
M&E & Technology	Weekly	M&E and Technology	Safety Inspection	X	X	X	X	X	Not Required	Slow moving vehicle	Experienced Highways Inspector & driver	In accordance with CS452
Ventilation	Year 2, 4		General Inspection		X		X		Off Peak Single Bore closures	TM crew & Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CS452 and CM 430
Lighting					X		X		Off Peak Single Bore closures	TM crew & Lifting platforms		In accordance with CS452
Drainage/sumps					X		X		Off Peak Single Bore closures	TM crew & Gully cleansing vehicle	Senior tunnel operational and maintenance staff	In accordance with CS452
Fire safety					X		X		Off Peak Single Bore closures	TM crew & Lifting platforms		In accordance with CS452
Communications & traffic controls					X		X		Off Peak Single Bore closures	TM crew & Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CS452
Plant control					X		X		Off Peak Single Bore closures	Handheld mounted devices		In accordance with CS452
Electrical power					X		X		Off Peak Single Bore closures	Electrical Power testing devices	Senior tunnel operational and maintenance staff	In accordance with CS452
Building services					X		X		Not Required	Handheld mounted devices		In accordance with CS452
Ventilation	Year 1, 3, 5 & 3 yearly thereafter	M&E and Technology	Principal Inspection	X		X		X	Off Peak Single Bore closures	TM crew & Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CS452 and CM 430
Lighting				X		X		X	Off Peak Single Bore closures	TM crew & Lifting platforms		In accordance with CS452
Drainage/sumps				X		X		X	Off Peak Single Bore closures	TM crew & Gully cleansing vehicle	Senior tunnel operational and maintenance staff	In accordance with CS452

Location	Frequency	Asset Group	Description of Works	Year					Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5				
Fire safety				X		X		X	Off Peak Single Bore closures	TM crew & Lifting platforms		In accordance with CS452
Communications & traffic controls				X		X		X	Off Peak Single Bore closures	TM crew & Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CS452
Plant control				X		X		X	Off Peak Single Bore closures	Handheld mounted devices		In accordance with CS452
Electrical power				X		X		X	Off Peak Single Bore closures	Electrical Power testing devices	Senior tunnel operational and maintenance staff	In accordance with CS452
Building services				X		X		X	Not Required	Handheld mounted devices		In accordance with CS452
pumps, valves, vortex separators, penstocks, and other specialised equipment	in line with manufacturer's recommendations where available.			X		X		X	Off Peak Single Bore closures	TM crew & Crane, mounted devices	Senior drainage staff	in line with manufacturer's recommendations where available.
All Drainage Asset	Weekly	Drainage	Safety Inspection	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS551
Pipes and Chambers	Year 1 & 5 & 10% a year thereafter		Visual inspection	X				X	Off peak Full Closures	Inspection Camera System/ laser profiler	Senior inspector with at least five years' experience	In accordance with CS551
Inlets and outlets & Ancillary drainage items	Annually			X	X	X	X	X		lifting cover/grating lifter & pole mounted camera		In accordance with CS551
Ditches and channels	Year 1 & 5 & 20% a year thereafter			X				X		TM crew & handheld device (i.e. tablet)	Senior inspector with at least five years' experience	In accordance with CS551
												In accordance with CS551
Ponds	Year1,3 & 5			X		X		X	Not Normally Required	Vehicle mounted devices	Senior inspector with at least five years' experience	In accordance with CS551
Filter drains	Annually			X	X	X	X	X		Vehicle mounted GPR		In accordance with CS551
Maintenance Programme (including skills& resource and equipment requirements)												
All Roads and Affected property	Annually	Pavements	Sweeping and cleaning	X	X	X	X	X	Impact Protection Vehicle	Sweeping vehicle	Highway Maintenance staff	Sweeping and cleaning. In accordance with GM 701
Road Markings and Road Studs	Every 5 years	Road Markings and Road Studs	Service maintenance					X	Off peak Full Closures	Road Marking and road stud Machines.	Road marking Maintenance staffs	In accordance with CS126 and requirements of the manufacturer's operation and maintenance manual.
All RRS barrier systems (excl. concrete barriers)	Every 2 years	Road Restraint Systems	Tighten or replace screws and bolts and re-tension barrier	50%	50%	50%	50%	50%	Off peak Full Closures	TM crew & barrier maintenance gang	Trained highway maintenance staff	In accordance with manufacturer's recommendations or CD 377
Traffic signs (except Traffic signs mounted above the carriageway)	Every 3 years	Road Traffic Signs	Clean all traffic sign faces and reference numbers			X			Off peak Full Closures	Lifting platforms and Low-pressure jetting unit	Trained highway maintenance staff	In accordance with CM125
Mechanical elements of traffic signs			Service maintenance			X				Mechanical and Electrical Tools		In accordance with the requirements of the manufacturer's operation and maintenance manual.
Electrical component			Service maintenance			X						In accordance with the requirements of the manufacturer's operation and maintenance manual.
All Highway Structures	Annually	Structures	Minor or routine maintenance	X	X	X	X	X	Off peak Full Closures	Lifting platforms low pressure jetting unit	Structures Inspector/Engineer	Includes repainting & removing vegetation.
Culvert	Annually	Structures	Minor or routine maintenance	X	X	X	X	X	Off peak Full Closures	Slow moving vehicle	Structures Inspector/Engineer	Remove debris and sediment
CCTV mast ancillary equipment	Annually	Structures	Service maintenance	X	X	X	X	X	Off peak Full Closures	Lifting platforms	Trained electrical maintenance staff	Grease winch mechanism and check mast breaking system In accordance with CM430
Tunnel Structures	4 times per year	Tunnel Structures	Surface washing	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms low pressure jetting unit	Senior tunnel operational and maintenance staff	In accordance with CM430
Ventilation systems	Every 3 months	M&E and Technology	Cleaning	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Ventilation systems	Every 5 years		Service maintenance					X	Off Peak Single Bore closures	Lifting platforms		In accordance with CM430 and manufacturer's recommendations
Lighting	Not exceed 12 months		Cleaning	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms		In accordance with CM430

Location	Frequency	Asset Group	Description of Works	Year					Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5				
Drainage (Pumping systems)	Annually		Cleaning	X	X	X	X	X	Off Peak Single Bore closures	Gulley emptying machine	Maintenance crew	In accordance with CM430 and manufacturer's recommendations
Fire safety equipment	Every 3 months		cleaning and lubrication	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Traffic control, communication and information systems	Every 3 months		Cleaning	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Tunnel control and management system (TCMS)	Every 5 years		Service maintenance					X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Back-up/Testing of software and data files	Annually		Service maintenance	X	X	X	X	X	Not required	None	Senior tunnel operational staff	In accordance with CM430 and manufacturer's recommendations
solid state radar array heads	Every 5 years		Service maintenance					X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Plant monitoring and control system	Every 6 months		Service maintenance	X	X	X	X	X	Not required	None	Senior tunnel operational staff	In accordance with CM430 and manufacturer's recommendations
High voltage system circuit breakers and transformers	Every 3 months		Service maintenance	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Trained electrical maintenance staff	In accordance with CM430 and BS 6626
Low voltage system switchboards, switchgear and distribution panels	Every 3 months		Service maintenance	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Trained electrical maintenance staff	In accordance with CM430 and BS EN 61439-1
Emergency power equipment	Every 3 months		Service maintenance	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Trained electrical maintenance staff	In accordance with CM430
Tunnel services building and plant rooms	Annually		Cleaning and Service maintenance	X	X	X	X	X	Not required	None	Senior tunnel operational staff	In accordance with CM430 and manufacturer's recommendations
Chambers, inter-connecting pipework, Linear drainage systems and Gullies	24 monthly intervals	Drainage Asset	Emptying and cleaning		X		X		Off Peak Single Bore closures	gully vacuum tankers and high-pressure jet	Trained drainage maintenance staff	Sediments and debris shall be removed from chambers, pipes, Linear drainage systems and gullies
Grips	24 monthly intervals		Cleaning		X		X		Off peak Full Closures	mechanical auger or hand cutting	Trained drainage maintenance staff	Grips will be cleared from debris and weed growth
Ditches and ponds	Every 5 years		Cleaning					X	Off peak Full Closures	mechanical auger or hand cutting	Trained drainage maintenance staff	Ditches and ponds will be maintained by removing annual slub and weed build up that could impair operation.
Infiltration tanks	Every 2 years		Cleaning		X		X		Off peak Full Closures	gully vacuum tankers and high-pressure jet	Trained drainage maintenance staff	Chambers access to tank will be maintained in the same way as gullies
Infiltration basin	3 times a year		Cleaning	X	X	X	X	X	Off peak Full Closures	will be carried out by hand, although a suction tanker	Trained drainage maintenance staff	cutting vegetation and removing of debris and sediments
vortex separators	Every 6 months		Cleaning	X	X	X	X	X	Off peak Full Closures	vacuum tanker vehicle	Trained drainage maintenance staff	emptying retained sediment and cleaning in accordance with manufacturer's requirements
Asset Lifecycle Programme (including skills& resource and equipment requirements)												
No works required in the first 5 years												

7. Twenty-Five Year Asset Management Plan

Table 7-1: Twenty-Five Year Asset Management Plan

Location	Frequency	Asset Group	Description of Works	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Traffic Management	Plant & Equipment	Resource & Skills	Comments
Condition Inspection & Surveys Programme (including skills& resource and equipment requirements)																																
Lane 1, 2 & slips	Weekly	Pavements	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS229
Lane 1 & Lane 1 slips	Annually		TRACS survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		TRACS survey vehicle	Sub-contract to specialist supplier	In accordance with CS230
Lane 2 & Lane 2 slips	Year 1, 3 & 5			X		X		X		X		X		X		X		X		X		X		X		X		X				In accordance with CS230
Lane 1 & Lane 1 slips	Annually		SCRIM Survey	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		SCRIM Survey Devices		In accordance with CS228
Lane 2 & Lane 2 slips	Year 1, 3 & 5			X		X		X		X		X		X		X		X		X		X		X		X		X				In accordance with CS228
Lane 1, Lane 2 and slips	Year 1, 3 & 5		Video/Visual Survey	X		X		X		X		X		X		X		X		X		X		X		X		X		Traffic speed using 4K imaging equipment	Experienced highway engineers	In accordance with CS227
Road Markings & Studs	Weekly	Road Markings and Road Studs	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Impact Protection Vehicle	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS126
Road markings	1 day-time inspection every 12 months		Visual inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		A vehicle mounted devices	Trained road marking inspector	In accordance with CS126
Road studs			Visual inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				In accordance with CS126
Road markings	1 night-time inspection every 12 months		Visual inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				In accordance with CS126
Road studs			Visual inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				In accordance with CS126
Road Restraint Systems (RRS)	Weekly	Road Restraint Systems	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CD 377
Steel RRS	Every 6 months		General Inspections	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		Vehicle mounted devices	Highway inspector with specialist experience and knowledge of restraint systems	In accordance with CD 377
Concrete RRS	Every 6 months			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		Vehicle mounted devices		In accordance with CD 377
Steel road RRS	Every 2 years		Detailed Inspections		X		X		X		X		X		X		X		X		X		X		X		X		Off-peak Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with CD 377
Concrete RRS	Every 2 years				X		X		X		X		X		X		X		X		X		X		X		X					In accordance with CD 377
S-A-B Gate & Movable RRS	Annually		Detailed Inspections	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				In accordance with manufacturers requirements (6 & 12 months after installation, then annually)
Road Traffic Signs (RTS)	Weekly	Road Traffic Signs	Safety inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS125 and BS 7671
RTS	Annually	Road Traffic Signs	General Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Vehicle mounted devices	Experienced Traffic sign Inspector & driver	In accordance with CS125 and BS 7671
Sign face and fixings, Posts and Lighting units	Annually	Road Traffic Signs	Principal Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with CS125 and BS 7671

Location	Frequency	Asset Group	Description of Works	Year																									Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
Electrical or mechanical testing	Year 1 & 5			X				X					X					X					X					X	Full Closures	TM crew & handheld device (i.e. tablet)		In accordance with CS125 and BS 7671
Retro-reflectivity	Annually (10% of Assets)			10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	Impact Protection Vehicle	Calibrated handheld retro reflectometer		In accordance with CS125 and BS 7671
All Highway Structures	Weekly	Structures	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Drone survey or binoculars / camera	Trained highway safety inspector	In accordance with CS450
Large culverts	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required	Hammer tapping and thickness measurements	Structures Inspector/Engineer	In accordance with CS450
Large culverts	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures	Drone survey or binoculars / camera		In accordance with CS450
Bridge	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required		Structures Inspector/Engineer	In accordance with CS450
Bridge	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures			In accordance with CS450
Small culvert or small span structure	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required		Structures Inspector/Engineer	In accordance with CS450
Small culvert or small span structure	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures			In accordance with CS450
Retaining wall	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required	Hammer tapping and thickness measurements	Structures Inspector/Engineer	In accordance with CS450
Retaining wall	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures			In accordance with CS450
Underpasses	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required	Drone survey or binoculars / camera	Structures Inspector/Engineer	In accordance with CS450
Underpasses	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures			In accordance with CS450
Sign/signal gantry	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required		Structures Inspector/Engineer	In accordance with CS450
Sign/signal gantry	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures			In accordance with CS450
High mast	Year 3 of Maintenance Period then every 2 years		General inspection			X				X		X				X		X				X		X				X	Not Required		Structures Inspector/Engineer	In accordance with CS450

A303 Amesbury to Berwick Down (Stonehenge)

Template C – Outline Asset Management Forward Plan

Location	Frequency	Asset Group	Description of Works	Year																									Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
High mast	Year 1 & 5 of Maintenance Period then every & 6 years		Principal inspection	X				X						X						X						X			Off Peak Full Closures			In accordance with CS450
All Tunnel Structure	Weekly	Tunnel Structure	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Impact Protection Vehicle	Slow moving vehicle	Experienced Highways Inspector & driver	In accordance with CS452 and CS450
Tunnel structure eastbound	Year 3 of Maintenance Period and then every 2 years		General Inspection			X				X		X				X		X				X		X				X	Off Peak Single Bore closures	TM crew & handheld device (i.e. tablet)	Trained tunnel staffs	In accordance with CS452 and CS450
Tunnel structure westbound						X				X		X				X		X				X		X				X				In accordance with CS452 and CS450
Tunnel structure eastbound	Year 1 & 5 of Maintenance Period then every 6 years		Principal Inspection	X				X						X						X						X						In accordance with CS452 and CS450
Tunnel structure westbound				X				X						X						X						X						In accordance with CS452 and CS450
M&E and Technology	Weekly	M&E and Technology	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Senior tunnel operational and maintenance staff	In accordance with CS452
Ventilation	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures	Lifting platforms		In accordance with CS452
Ventilation	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures			In accordance with CS452
Lighting	Year 2, 4 then Annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures			In accordance with CS452
Lighting	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures			In accordance with CS452
Drainage/sumps	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures	Gully cleansing vehicle	Senior tunnel operational and maintenance staff	In accordance with CS452
Drainage/sumps	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures			In accordance with CS452
Fire safety	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures	Handheld mounted devices		In accordance with CS452
Fire safety	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures			In accordance with CS452
Communications and traffic controls	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures	Lifting platforms		In accordance with CS452
Communications and traffic controls	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures		Senior tunnel operational and maintenance staff	In accordance with CS452
Plant control	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures	Handheld mounted devices		In accordance with CS452
Plant control	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures			In accordance with CS452
Electrical power	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Off Peak Single Bore closures	Electrical Power testing devices		In accordance with CS452
Electrical power	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures			In accordance with CS452
Building services	Year 2, 4 then annually		General Inspection		X		X		X	X		X	X		X	X		X	X		X	X		X	X		X	X	Not Required	Electrical Power testing devices	Senior tunnel operational and maintenance staff	In accordance with CS452
Building services	Year 1, 3, 5 then every 3 years		Principal Inspection	X		X		X			X			X			X			X			X			X				Handheld mounted devices		In accordance with CS452
pumps, valves, vortex	in line with manufacturer's recommendation		Principal Inspection	X		X		X			X			X			X			X			X			X			Off Peak Single Bore closures	Crane, mounted devices		in line with manufacturer's recommendations where available.

Location	Frequency	Asset Group	Description of Works	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Traffic Management	Plant & Equipment	Resource & Skills	Comments
separators & penstocks,	s where available.																															
All Drainage Asset	Weekly	Drainage	Safety Inspection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Car / Van, handheld device (i.e. tablet) & HD camera system	Experienced Highways Inspector & driver	In accordance with CS551
Pipes and Chambers	Year 1 & 5 & 10% a year thereafter		Visual inspection	X				X	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	10 %	Off peak Full Closures	Inspection Camera System/ laser profiler	Senior inspector with at least five years' experience	In accordance with CS551
Inlets and outlets & Ancillary drainage items	Annually			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	lifting cover/grating lifter & pole mounted camera	Senior inspector with at least five years' experience	In accordance with CS551
Ditches and channels	Year 1 & 5 & 20% a year thereafter			X				X	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	Off peak Full Closures	TM crew & handheld device (i.e. tablet)	Senior inspector with at least five years' experience	In accordance with CS551 In accordance with CS551
Ponds	Year 1, 3 & 5 of Maintenance Period then every 2 years			X		X		X		X		X		X		X		X		X		X		X		X		X	Off peak Full Closures	Vehicle mounted devices	Senior inspector with at least five years' experience	In accordance with CS551
Filter drains	Annually			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not Required	Vehicle mounted GPR		In accordance with CS551
Maintenance Programme (including skills& resource and equipment requirements)																																
All Roads and Affected property	Annually	Pavements	Sweeping and cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Impact Protection Vehicle	Sweeping vehicle	Highway Maintenance staff	Sweeping and cleaning. In accordance with GM 701
Road Markings and Road Studs	Every 5 years	Road Markings and Road Studs	Service maintenance					X					X					X					X					X	Off peak Full Closures	Road Marking and road stud Machines.	Road marking Maintenance staffs	In accordance with CS126 and requirements of the manufacturer's operation and maintenance manual.
RRS (excl. concrete barriers)	every 2 years	Road Restraint Systems	Tighten or replace screws and bolts & re-tension barrier	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	50 %	Off peak Full Closures	TM crew & barrier maintenance gang	Trained highway maintenance staff	In accordance with manufacturer's recommendations or CD 377
Traffic signs mounted above the carriageway	Every 6 years	Road Traffic Signs	Clean all traffic sign faces and reference numbers						X						X						X						X		Off peak Full Closures	Lifting platforms and Low-pressure jetting unit	Trained highway maintenance staff	In accordance with CM125
Other traffic signs	Every 3 years					X			X			X			X			X			X			X			X				
Mechanical elements of traffic signs			Service maintenance			X			X			X			X			X			X			X			X			Mechanical and Electrical Tools	In accordance with the requirements of the manufacturer's operation and maintenance manual.
Electrical component			Service maintenance			X			X			X			X			X			X			X			X				
All Highway Structures	Annually	Structures	Minor or routine maintenance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	Lifting platforms low pressure jetting unit	Structures Inspector/Engineer	Includes repainting & removing vegetation.
Culvert	Annually	Structures	Minor or routine maintenance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	Slow moving vehicle	Structures Inspector/Engineer	Remove debris and sediment
CCTV mast ancillary equipment	Annually	Structures	Service maintenance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	Lifting platforms	Trained electrical maintenance staff	Grease winch mechanism and check mast breaking system In accordance with CM430

Location	Frequency	Asset Group	Description of Works	Year																								Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
Tunnel Structures	4 times per year	Tunnel Structures	Surface washing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms, vehicle mounted spray bar and vehicle mounted rotating brushes	Senior tunnel operational and maintenance staff	In accordance with CM430
Ventilation systems	Every 3 months	M&E and Technology	Cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms and Low-pressure jetting unit	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Ventilation systems	Every 5 years		Maintenance Service					X					X					X					X					X	Off Peak Single Bore closures	Lifting platforms and Low-pressure jetting unit	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Lighting	Not exceed 12 months		Cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Senior lighting operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Lighting systems	Every 1 years		Maintenance Service												X												X		Off Peak Single Bore closures	Lifting platforms and Low-pressure jetting unit	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Drainage (Pumping systems)	Annually		Cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	gully vacuum tankers and high-pressure jet	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Drainage (Pumping systems)	Every 10 years		rebuild										X										X						Not required	Crane or similar lifting equipment	Senior drainage operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Fire safety equipment	Every 3 months		cleaning & lubrication	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Firefighting and fixed firefighting suppression systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Smoke and fire detection alarm systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Traffic control, Communication and information systems	Every 3 months		Cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not required	Lifting platforms and Low-pressure jetting unit	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Traffic monitoring and management systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Communications systems, including emergency and maintenance telephones	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Tunnel control and management system (TCMS)	Every 5 years		Maintenance Service					X					X					X					X					X	Off Peak Single Bore closures	Lifting platforms and Low-pressure jetting unit	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Variable message signs	Every 13 years		Maintenance Service													x													Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Back-up/Testing of software and data files	daily		Maintenance Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not required	None	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Solid state radar array heads	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with CM430 and manufacturer's recommendations

Location	Frequency	Asset Group	Description of Works	Year																									Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
Plant monitoring and control system	Every 6 months		Maintenance Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms		In accordance with CM430 and manufacturer's recommendations
High voltage system circuit breakers and transformers	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Trained electrical maintenance staff	In accordance with CM430 and BS 6626
Low voltage system switchboards, switchgear and distribution panels	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with CM430 and BS EN 61439-1
Power and communications cabling	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with CM430
CCTV and PA systems	Every 7 years		Maintenance Service							X							X							X					Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430
Incident detection and management systems 1	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with manufacturer's recommendations
Speed control and enforcement systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with manufacturer's recommendations
Overheight vehicle detection systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with manufacturer's recommendations
Tunnel closure systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with manufacturer's recommendations
Speed limit indicators	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with manufacturer's recommendations
Queue detection systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with manufacturer's recommendations
Weather monitoring systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with manufacturer's recommendations
Security and evacuation systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with manufacturer's recommendations
Cabinets and plinths	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with manufacturer's recommendations
Technology systems associated with the operation of the tunnel that extend beyond the extents	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with manufacturer's recommendations
Incident detection and management systems	Every 10 years		Maintenance Service										X										X						Off Peak Single Bore closures	Lifting platforms		In accordance with CM430
Emergency power equipment	Every 3 months		Maintenance Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off Peak Single Bore closures	Lifting platforms	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations
Tunnel services building and plant rooms	Annually		Cleaning & Maintenance Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Not required	None		

Location	Frequency	Asset Group	Description of Works	Year																									Traffic Management	Plant & Equipment	Resource & Skills	Comments
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25				
Chambers, inter-connecting pipework, Linear drainage systems and Gullies	24 monthly intervals	Drainage Asset	Emptying and cleaning		X		X		X		X		X		X		X		X		X		X		X		X		Off peak Full Closures	gully vacuum tankers and high-pressure jet	Trained drainage maintenance staff	Sediments and debris shall be removed from chambers, pipes, Linear drainage systems and gullies
Grips	24 monthly intervals		Cleaning		X		X		X		X		X		X		X		X		X		X		X		X		Off peak Full Closures	mechanical auger or hand cutting	Trained drainage maintenance staff	Grips will be cleared from debris and weed growth
Ditches and ponds	Every 5 years		Cleaning					X					X					X					X					X	Off peak Full Closures	mechanical auger or hand cutting	Trained drainage maintenance staff	Ditches and ponds will be maintained by removing annual slub and weed build up that could impair operation.
Infiltration tanks	Every 2 years		Cleaning		X		X		X		X		X		X		X		X		X		X		X		X		Off peak Full Closures	gully vacuum tankers and high-pressure jet	Trained drainage maintenance staff	Chambers access to tank will be maintained in the same way as gullies
Infiltration basin	3 times a year		Cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	will be carried out by hand, although a suction tanker	Trained drainage maintenance staff	cutting vegetation and removing of debris and sediments
vortex separators	Every 6 months		Cleaning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Off peak Full Closures	vacuum tanker vehicle	Trained drainage maintenance staff	emptying retained sediment and cleaning in accordance with manufacturer's requirements
Asset Lifecycle Programme (including skills& resource and equipment requirements)																																
Lane 1, 2 & slips	Years 14 – 17	Pavements	resurfacing														25 %	25 %	25 %	25 %									Off peak road / Single Bore closures*	road resurfacing machine	Pavement Maintenance staffs	5% binder course replacement included
Road Markings and Road Studs	Years 14 – 17	Road Markings and Road Studs	Renew														25 %	25 %	25 %	25 %									Off peak road / Single Bore closures*	Road Marking and road stud Machines.	Road marking Maintenance staffs	Road markings will be renewed following surfacing work
Noise Barrier	Year 20	Structures	Replace																				X						Off peak Full Closures	crane or similar lifting equipment	Structures Maintenance staffs	Replace Noise Barrier Panel
Ventilation systems	Every 22 years		Replace																						X				Off Peak Single Bore closures	Lifting platforms and	Senior tunnel operational and maintenance staff	In accordance with CM430 and manufacturer's recommendations.
M&E and technology related systems, controls, fixtures & fittings	Every 12 years	M&E and Technology	Renew												X												X		Off Peak Single Bore closures	Lifting platform	Senior tunnel operational and maintenance staff	In accordance with CM430
CCTV and PA systems	Every 15 years		Replace															X														
Tunnel services buildings systems	Every 7 years		Renew							X							X							X					Not required	None	Senior tunnel operational and maintenance staff	In accordance with CM430
Sensors and asset performance monitoring and fault management technology and systems	Every 10 years		Renew										X										X						Not required	None	Senior tunnel operational and maintenance staff	In accordance with CM430

Appendices

Utilities Power Consumption, Manufacturer's Data Sheets, Technical Specifications, Manufacturer's Warranties & Maintenance regime recommendation

Utilities Power Consumption

Name/ Type	Unit	Load value (kW)	Diversity factor	Hours/day	Days	TOTAL KWh / year	Years	TOTAL KWh	Remark
Bore 1									
East Tunnel Services Building									
Jet fans - Supply A	7	47	0,5	1	365	**60.042,50**	25	1.501.063	Average, not working daily. Working at contraflow during maintenance periods & emergency allowance
Jet fans - Supply B	7	47	0,5	1	365	**60.042,50**	25	1.501.063	Average, not working daily. Working at contraflow during maintenance periods & emergency allowance
Lighting (twin boost)	135	0,591	0,4	12	365	**139.783,32**	25	3.494.583	increased efficiency LED chip and dimmed power output for increased lifetime expectancy
Lighting (single boost)	10	0,30	0,4	12	365	**5.185,92**	25	129.648	
Lighting (single boost)	12	0,14	0,4	12	365	**2.901,31**	25	72.533	
Lighting (single boost)	27	0,07	0,4	12	365	**3.263,98**	25	81.599	
Lighting (single basic/emergency)	155	0,04	0,2	24	365	**11.405,52**	25	285.138	
Lighting (single basic/emergency)	1391	0,04	0,2	24	365	**102.355,34**	25	2.558.884	
Cross Passage	18	0,010	1	2	12	**4,20**	25	105	2 maintenance visits/month
Evacuation Lighting	33	0,002	1	2	12	**1,58**	25	40	1 test/month
Emergency Lighting (Cross Passages)	26	0,005	1	24	365	**1.149,75**	25	28.744	
undercroft Lighting	278	0,007	1	10	255	**4.962,30**	25	124.058	
UPS backed Comms	10	11	1	24	365	**963.600,00**	25	24.090.000	
Drainage pumps	1	141	1	1	365	**51.465,00**	25	1.286.625	2 days: 1 cleaning per year + 1 day FFFS test
Low point sump pumps	1	2,9	**1**	1	365	**1.058,50**	**25**	26.463	
Hydrant main pressurisation pumps	1	250	1	2	4	**2.000,00**	25	50.000	Average and maintenance tests
Fire Pumps (WTSB)	1	129	1	2	4	**1.032,00**	25	25.800	Average and maintenance tests
Ultra-Rapid EV Charger	1	350	0,5	4	255	**178.500,00**	25	4.462.500	
West Tunnel Services Building									
Jet fans - Supply A	7	47	0,5	1	365	**60.042,50**	25	1.501.063	
Jet fans - Supply B	7	47	0,5	1	365	**60.042,50**	25	1.501.063	
Lighting (twin boost)	135	0,591	0,4	12	365	**139.783,32**	25	3.494.583	
Lighting (single boost)	10	0,30	0,4	12	365	**5.185,92**	25	129.648	
Lighting (single boost)	12	0,14	0,4	12	365	**2.901,31**	25	72.533	
Lighting (single boost)	27	0,07	0,4	12	365	**3.263,98**	25	81.599	
Lighting (single basic/emergency)	155	0,04	0,2	24	365	**11.405,52**	25	285.138	
Lighting (single basic/emergency)	1391	0,04	0,2	24	365	**102.355,34**	25	2.558.884	
Cross Passage	18	0,010	1	2	12	**4,20**	25	105	
Evacuation Lighting	33	0,002	1	2	12	**1,58**	25	40	
Emergency Lighting	26	0,005	1	24	365	**1.149,75**	25	28.744	
undercroft Lighting	278	0,007	1	10	255	**4.962,30**	25	124.058	
UPS backed Comms	11	11	**1**	24	365	**1.059.960,00**	25	26.499.000	
hydrant main pressurisation pumps	1	250	1	2	4	**2.000,00**	25	50.000	
Fire Pumps (WTSB)	1	129	1	2	4	**1.032,00**	25	25.800	
Ultra-Rapid EV Charger	1	350	0,5	4	255	**178.500,00**	25	4.462.500	
Bore 2									
East Tunnel Services Building									
Jet fans - Supply A	7	47	0,5	1	365	**60.042,50**	25	1.501.062,50	
Jet fans - Supply B	7	47	0,5	1	365	**60.042,50**	25	1.501.062,50	
Lighting (twin boost)	135	0,591	0,4	12	365	**139.783,32**	25	3.494.583	
Lighting (single boost)	10	0,30	0,4	12	365	**5.185,92**	25	129.648	
Lighting (single boost)	12	0,14	0,4	12	365	**2.901,31**	25	72.533	
Lighting (single boost)	27	0,07	0,4	12	365	**3.263,98**	25	81.599	
Lighting (single basic/emergency)	155	0,04	0,2	24	365	**11.405,52**	25	285.138	
Lighting (single basic/emergency)	1391	0,04	0,2	24	365	**102.355,34**	25	2.558.884	
Cross Passage	5	0,010	1	2	12	**1,26**	25	32	**2 maintenance visits/month**
Evacuation Lighting	33	0,002	1	2	12	**1,58**	25	40	
Emergency Lighting	26	0,005	1	24	365	**1.149,75**	25	28.744	
undercroft Lighting	278	0,007	1	10	255	**4.962,30**	25	124.058	
UPS backed Comms	11	11	1	24	365	**1.059.960,00**	25	26.499.000	
Drainage pumps	2	141	1	1	365	**102.930,00**	25	2.573.250	2 days: 1 cleaning per year + 1 day FFFS test
Low point sump pumps	2	2,9	1	2	4	**46,40**	25	1.160	
hydrant main pressurisation pumps	1	250	1	1	365	**91.250,00**	25	2.281.250	
Fire Pumps (WTSB)	1	129	1	6	4	**3.096,00**	25	77.400	
Ultra-Rapid EV Charger	1	350	0,5	4	255	**178.500,00**	25	4.462.500	
West Tunnel Services Building									
Jet fans - Supply A	7	47	0,5	1	365	**60.042,50**	25	1.501.062,50	
Jet fans - Supply B	7	47	0,5	1	365	**60.042,50**	25	1.501.062,50	
Lighting (twin boost)	135	0,591	0,4	12	365	**139.783,32**	25	3.494.583	
Lighting (single boost)	10	0,30	0,4	12	365	**5.185,92**	25	129.648	
Lighting (single boost)	12	0,14	0,4	12	365	**2.901,31**	25	72.533	
Lighting (single boost)	27	0,07	0,4	12	365	**3.263,98**	25	81.599	
Lighting (single basic/emergency)	155	0,04	0,2	24	365	**11.405,52**	25	285.138	
Lighting (single basic/emergency)	1391	0,04	0,2	24	365	**102.355,34**	25	2.558.884	
								0,00	
Cross Passage	5	0,010	1	2	12	**1,26**	25	32	
Evacuation Lighting	33	0,002	1	2	12	**1,58**	25	40	1 test /month
Emergency Lighting	26	0,005	1	24	365	**1.149,75**	25	28.744	
undercroft Lighting	278	0,007	1	10	255	**4.962,30**	25	124.058	
UPS backed Comms	11	11	**1**	1	365	**44.165,00**	25	1.104.125	
hydrant main pressurisation pumps	1	250	1	1	365	**91.250,00**	25	2.281.250	
Fire Pumps (WTSB)	1	129	1	6	4	**3.096,00**	25	77.400	
Ultra-Rapid EV Charger	1	350	0,5	4	255	**178.500,00**	25	4.462.500	
TSB's M&E	1	estimation				**768.000,00**	25	19.200.000	
Trace heaters	1	estimation				**3.600,00**	25	90.000	
Undercroft gallery M&E	1	estimation				**4.920,00**	25	123.000	
Road light	1	estimation				**84.000,00**	25	2.100.000	
Architectural Lighting	1096	0,120	0,3	24	365	**345.634,56**	25	8.640.864	
Image Projectors	6	0,880	0,4	24	365	**18.501,12**	25	462.528	
Total Loads								**174.524.590**	
						MWh year		**KWh in 25 years**	
						6.980.984		**174.524,59**	

M&E and Technology

1. HIGH-VOLTAGE (HV) ELECTRICAL SYSTEMS

SWITCHGEAR

ABB

4.2 Maintenance intervals

We recommend carrying out the maintenance work at the following intervals:

Activity performed	According to section	Time interval in years	According to number of switching operations
Inspection	5.3	5(2)	
Maintenance	5.4	5(2)	(4)
Repairs	5.4	As required	As required

(2) Under more demanding service conditions, we recommend shortening this interval appropriately
(3) According to the results of the inspection
(4) GSec
Electrical endurance: 100 breaking operations at 630A
5 short-circuit making operations
Mechanical endurance: 5000 no-load operations
Circuit-breakers: See the manuals
Earthing switch: 5 making operations – 1000 no-load operations

Table 18. Maintenance intervals

2. LOW-VOLTAGE (LV) ELECTRICAL SYSTEMS

ORMAZABAL

De: Fielding, Laurence <laurence.fielding@ormazabal.com>
Enviado el: martes, 1 de junio de 2021 10:27
Para: Gonzalez Gabarda, Carlos
CC: Gómez Lucena, Jose Ismael; Labrador Agraso, Jose Antonio; Martin Blasco, Raquel; González Martín, José Manuel
Asunto: RE: Q51-2113028: A303 Salisbury Plain
Datos adjuntos: General Conditions of Sale-100_en_0.pdf; IG-078-EN-12 (COSMOS).pdf; IG-123-EN-10 cpg0.pdf

Carlos

I have done my best to comply with the requirements, identifying the sections of the sttached documents that describe our offer.

1. Warranty.
   To date any offer that we have provided has been budgetary and according to our standard terms of sale. The standard terms of sale are attached, section 9 deals with warranty.

2. Recommended maintenance intervals.
   I have attached the operation and maintenance manual for the equipment offered.
   11kV 630A, Document IG-078, Section 7
   11kV, 1250A, Document IG-123, Section 9

3. Life span.
   Cubicles have been designed for a service life in accordance with IEC 62271-200.

Best Regards

Laurence Fielding

Ormazabal - a **velatia** company -
National Sales Manager UK
Tel: +44 (0) 1744 739 304
Mobile: + 44 (0) 7721 126530
Fax: + 44 (0) 1744 738722
www.ormazabal.com

3. MECHANICAL & ELECTRICAL (M&E) AND TECHNOLOGY RELATED SYSTEMS, CONTROLS, FIXTURES & FITTINGS

3.1. LED LUMINARIES

3.1.1. TRT LIGHTING

RANGE OVERVIEW

Type	System Power	Symmetric Optics	Point Source Optics	Counterbeam Optics	Cornice Optics	CCT	Lumen Output	CRI
XRA-T-2	138	✓	✓	✓	✓	4000k	Up to 18,524lm	>70
XRA-T-4	276	✓	✓	✓	✓	4000k	Up to 37,048lm	>70
XRA-T-6	414	✓	✓	✓	✓	4000k	Up to 55,573lm	>70
XRA-T-8	552	✓	✓	✓	✓	4000k	Up to 74,097lm	>70
XRA-T-10	690	✓	✓	✓	✓	4000k	Up to 92,622lm	>70
XRA-T-12	828	✓	✓	✓	✓	4000k	Up to 111,146lm	>70

MADE IN THE UK

All information detailed within this datasheet is accurate at the date of issue.
The information provided is subject to change at our discretion.
If any questions arise or extra information is required, please contact TRT Lighting directly.

X-Range Twin Boost Luminaire Datasheet issue April 2020

RANGE OVERVIEW

Type	System Power	Symmetric Optics	Point Source Optics	Counterbeam Optics	Cornice Optics	CCT	Lumen Output	CRI
XRA-B-1	69	✓	✓	✓	✓	4000k	Up to 9262lm	>70
XRA-B-2	138	✓	✓	✓	✓	4000k	Up to 18,524lm	>70
XRA-B-3	207	✓	✓	✓	✓	4000k	Up to 27,787lm	>70
XRA-B-4	276	✓	✓	✓	✓	4000k	Up to 37,049lm	>70
XRA-B-5	345	✓	✓	✓	✓	4000k	Up to 46,311lm	>70
XRA-B-6	414	✓	✓	✓	✓	4000k	Up to 55,573lm	>70

MADE IN THE UK

All information detailed within this datasheet is accurate at the date of issue.
The information provided is subject to change at our discretion.
If any questions arise or extra information is required, please contact TRT Lighting directly.

X-Range Boost Luminaire Datasheet issue April 2020

RANGE OVERVIEW

Type	System Power	Symmetric Optics	Point Source Optics	Counterbeam Optics	Cornice Optics	CCT	Lumen Output	CRI
XRA-I-4	25W	✓	✓	✓	✓	4000k	Up to 4083lm	>70
XRA-I-7	40W	✓	✓	✓	✓	4000k	Up to 7040lm	>70

Life Expectancy basic luminaires

AII TRT equipment is tested to worst case conditions i.e. the LEDs and drivers are at full power and generating maximum heat - these are the figures that are then used to project the lifetime of TRT products. Dueto the nature of tunnel lighting the luminaires will be dimmed for the vast majority of their life.

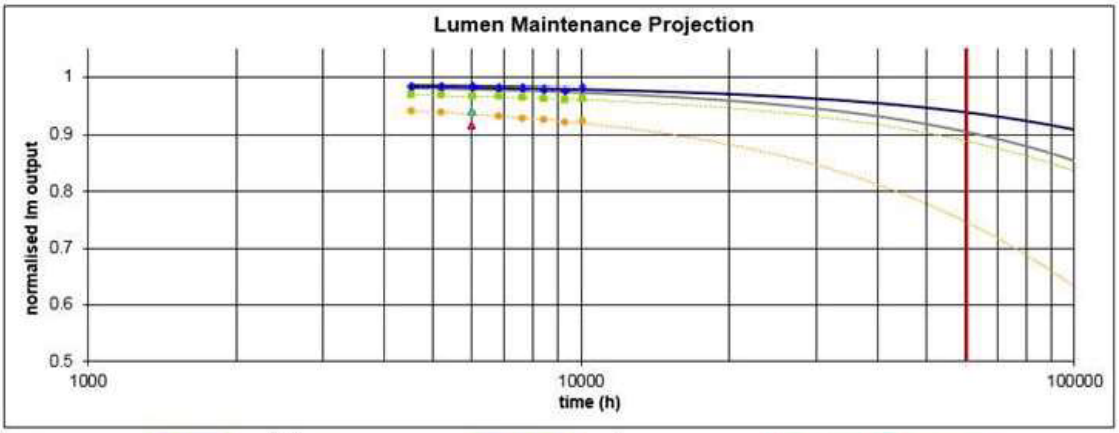
To meet the required luminance value, the basic luminaires are only required to run at 30% of their design output, the lumen output would be ~2,lO0lm ata wattage of ~12w. This has the added benefit of reducing temperatures and increasing life expectancy.

At the tested 100% output, the ISTM (thermal) data shows that the hottest LED is 21.345º((see test data table below), the maximum rated temperature is 115.63ºC.

No.	Thermocouple Position	Measured Temperature (°C)	Corrected Temperature (°C)	Maximum Rated Temperature (°C)	Allowable Temp. Increase to Max. (°C)
1	PCB 1 LED	25.771	20.233	115.63	95.397
2	PCB 1 LENS	25.891	20.353	80	59.647
3	PCB 1 TB	25.416	19.878	125	105.122
4	PCB 2 LED	26.258	20.72	115.63	94.91
5	PCB 2 LENS	26.144	20.606	80	59.394
6	PCB 3 LED	26.883	21.345	115.63	94.285
7	PCB 3 LENS	26.373	20.835	80	59.165
8	AMBIENT	20.538	15		

Lifetime Projection

By taking the hottest LED temperature found during the ISTM test (21.345º() and comparing that to the manufacturers LM-80 and TM-21 data, you can see that if we use the closest dataset of 55ºC (dark blue line -which is significantly higher than measured), the projected lifetime for the LED is in excess of 100,000 hours to L70, L80 and L90.



LM-80 test duration: 10,100 hours

TM-21 projection limit: 60,600 hours

Table 1

Enter projection parameters below	
In-situ case temperature (Tc, °C must be within the test range):	55
Lxx percentage of initial lumens to project to (e.g. for L70, enter 70):	90
Byy number (e.g. for B10, enter 10; B50 is always calculated):	10

Table 2

Lumen maintenance projections at specified *in-situ* Tc °C		
Byy	LxxByy TM-21lumen maintenance projection (hours)	lumen maintenance at TM-21limit (%)
50	*>60,600*	*94%*
10	*>60,600*	*91%*

Table 3

Legend	
55 °C 85 °C ## °C	B50 projections based on the LM-80 report data at test case temperatures Tc °C
	B50 projection at specified *in-situ* Tc °C
	Byy projection at specified *in-situ* Tc °C
	ENERGY STAR® Lumen Maintenance Requirements: LM>94.1% at 6,000h for non-residential and residential outdoor LM>91.8% at 6,000h for residential indoor
	TM-21 Extrapolation Limit

Given that this data is based on 100% output of the luminaire and for the Stonehenge project these fittings will only be run at 30%, **TRT are confident that the required road luminance level will still be met after 228k hours (26 years).**

Life expectancy boost luminaires

As with the basic luminaire, see the following ISTM test data from the luminaire which shows that the hottest LED is PCB 4 LED 26. The case temperature of this LED is 70.89ºC with a maximum temperature of 146.75ºC.

No.	Thermocouple Position	Measured Temperature (°C)	Corrected Temperature (°C)	Maximum Rated Temperature (°C)	Allowable Temp. Increase to Max. (°C)
1	PCB 1 LED 6	72.76	61.97	146.75	84.78
2	PCB2 LED 32	78.06	67.27	146.75	79.48
3	PCB 3 LED 28	80.63	69.84	146.75	76.91
4	PCB 4 LED 26	81.68	70.89	146.75	75.86
5	PCB 5 LED 31	78.09	67.30	146.75	79.45
6	PCB 6 LED 26	77.17	66.38	146.75	80.37
7	PCB 7 LED 10	76.37	65.58	146.75	81.17
8	PCB 8 LED 30	78.08	67.29	146.75	79.46
9	PCB 9 LED 31	80.71	69.92	146.75	76.83
10	PCB 10 LED 27	80.38	69.59	146.75	77.16
11	PCB 11 LED 1	80.13	69.34	146.75	77.41
12	PCB 12 LED 27	76.48	65.69	146.75	81.06
13	Lens Base	77.08	66.29	80.00	13.71
14	Lens Dome	75.72	64.93	80.00	15.07
15	Connector 1	60.05	49.26	125.00	75.74
16	Connector 2	72.51	61.72	125.00	63.28
17	Ambient	25.79	15.00	N/A	N/A

By taking the hottest LED temperature found during the ISTM test (70.89°C) and comparing that to the manufacturers LM-80 and TM-21 data, it can be seen that (by using the closest dataset of 85°C – green line), the projected lifetime for the LED is in excess of 100,000 hours to L70, L80 and L90.

LED drivers

LED drivers have an expected life of ~100k hours, **projected failure data beyond this point is not available from the manufacturers**. The driver however is a replaceable component, in the same way that lamps and gear were maintainable with HPS technology. TRT could offer a quick release gear tray to make sure this maintainable component is easy and quick to change.

than the maximum allowed to achieve 100k hour life expectancy, we would expect the lifetime to be As the drivers are not being run at 100% output and their case temperature will be significantly lower increase but as detailed above manufacturers will not underwrite this expectation. We would envisage a single bulk driver change on the basic luminaires and no change on the boost during the 26 years.

Component	Life expectancy (hrs)	Life expectancy (yrs)
Basic luminaire	>228,000	26
Boost luminaire	>114,000	26
Driver	>100,000	~12

3.1.2. SCHREDER

08/04/2021

Schréder

Lumen maintenance report

LED information

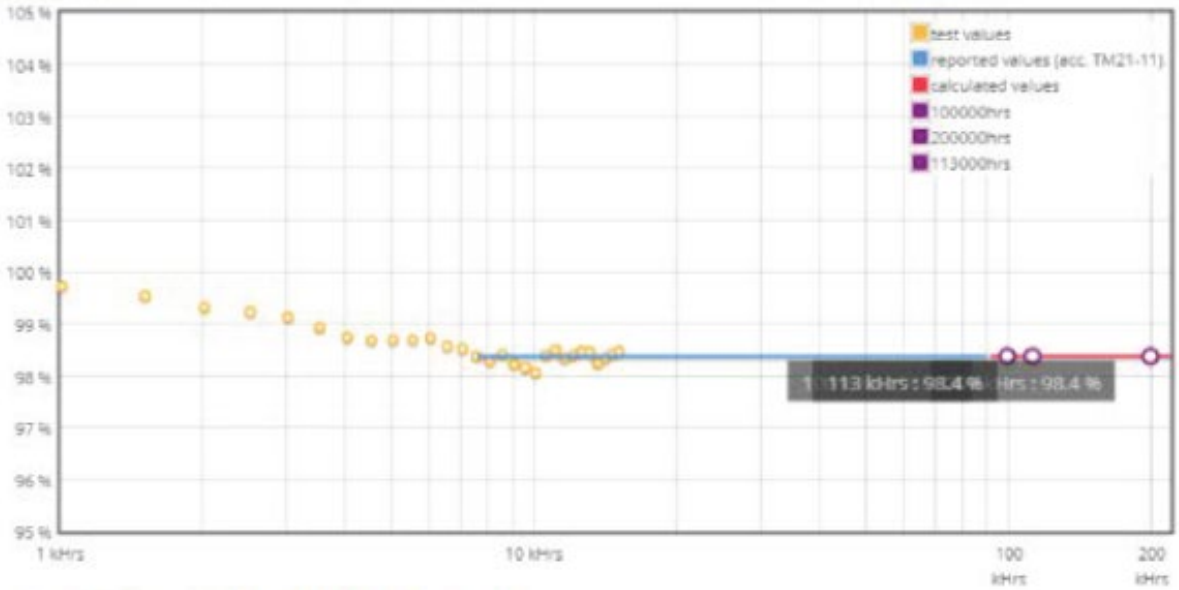
LED type	**XP-G3**
LED current	**1050 mA**
Ts	**85°C**
Description	**CLD AP216 REV11**

Projection data

Test duration	**15120 hrs**	**α**	**-1.882E-007**
Time used for projection	**7560 to 15120hrs**	**β**	**0.981**

L (%)	Time (kHrs)
98.4	100
98.4	200
98.4	113

Projection graphic



LxB50 results according to LM-80 and TM-21-11 procedures and norms.

LxBy results derived from LxB50 according to IEC 62717 Annex C.

3.1.3. SIGNIFY

Philips TubeLine

Signify

Dear Lieb Alexander,

Firstly, many thanks for asking Signify to participate in this LED tunnel lighting project at Stonehenge.

This document aims to provide product and warranty information related to the Philips TubeLine luminaire; to give you confidence that the Philips proposition delivers a reliable, long-term, high-quality solution.

Regarding the extended warranty (circa. 13 years/115k hours); as discussed, Signify do not usually provide warranties in excess of 10-years. However, following some internal discussions I have been advised that in certain circumstances, and by exception, longer warranties will be considered by our CEO, and we understand that in principle this project could meet the necessary criteria. We will be happy to undertake the required internal processes to seek approval when we are required to provide a formal tender. In the interim, we will be happy to prepare a budgetary price for our proposed solution for your evaluation which will include a consideration for the extended warranty at your request (subject to our internal approval of course).

We hope that you are fully satisfied with the information contained herewith. We would very much welcome the opportunity to discuss it with you in more detail and establish what additional support we could provide throughout the development of this project.

In the interim, should you need any additional information or if anything is unclear, please do not hesitate to contact me at your convenience.

I look forward to hearing from you.

Yours Sincerely

Timothy Baker
Key Account Manager

3.1.4. UPROAD LIGHTING

Option 2

Ground Uplighting with AL DOT

Solution: AL DOT L RGBW 0.3M PP 40PXL DIRECT

This system as standard will allow you to control either each individual dot or row of 40 dots so you could easily have colours fading/changing as you move along the tunnel.

- 1 x 3.285Km Linear runs per tunnel (like the images to the left)
- 274 x AL DOT L RGBW 0.3M PP 40PXL per 3.285km run
- Total 13’140 Meters = 1096 x AL DOT L RGBW 40PXL
- 1 x DOT Per 0.3m/40 dots per set = 12M Linear coverage