

BRIDGE OWNERS FORUM

MINUTES OF MEETING BOF 62: TUESDAY 5 NOVEMBER 2019 AT THE BEVES ROOM, KINGS COLLEGE, CAMBRIDGE

PRESENT:

Nick Burgess	TfL/LUL
Malcolm Cattermole	Forestry England
Henry Dempsey	SCOTS
Kevin Dentith	ADEPT
Andy Featherby	Canal and River Trust
Richard Fish	Technical Secretary
Tomas Garcia	HS2
Jim Hall	CSS Wales
Keith Harwood	ADEPT
Daniel Healy	Department for Infrastructure (Northern Ireland)
Jason Hibbert	Welsh Government
Trish Johnson	Big Bridge Group
Neil Loudon	Highways England
Campbell Middleton	Cambridge University Engineering Department (Chairman)
Paul Thomas	Railway Paths Ltd.
Sue Threader	Rochester Bridge Trust

Paul Fidler CUED

Guests:

Rubat Croos	Railway Paths Ltd.
Vladimir Vilde	CUED
Asher Lawrence-Cole	DfT TRIB
Ioannis Mavvidis	DfT TRIB
Joanne Geddes	Network Rail TRIB
Tassos	
Andrianopoulos	Highways England TRIB
Helena Russell	Freelance journalist

1. Welcome and Outline of Meeting

The Chairman welcomed everyone to the meeting and gave a brief personal reflection on the work of BOF since its founding in 2000, especially the progress that had been made in collaboration across the sector of bridge owners. He noted that the BOF 20th anniversary was next year which should be a cause for celebration.

He went on to explain the two special sessions in this meeting: one with guests from the DfT Transport Research and Innovation Board (TRIB) before lunch and another with Helena Russell who was to give her views on BOF's profile and visibility, acting as a critical friend.

2. Introductions and Apologies

Before the traditional introductions from new BOF members, the Chairman welcomed Rubat Croos who was attending as a junior member following the decision taken at BOF 61. Rubat is working with Paul Thomas at Railway Paths on secondment from Network Rail. The Chairman also introduced Vladimir Vilde who was a post-doctoral researcher at CUED; both were observers at today's meeting.

Richard Fish noted that apologies had been received from the following:

Bill Bryce	SSE
Liam Duffy	Transport Infrastructure Ireland
Colin Hall	Network Rail
Nicola Head	TfL
Hazel McDonald	Transport Scotland

Colin Hall and Nicola Head had been planning to attend but both had had to send late apologies due to sickness. The meeting welcomed the good news that Nicola was now back at work following her illness.

Richard noted that he and Philip Gray (TfL) had been trying to energise LoBEG into re-committing to BOF but so far with no success.

Richard also advised that, as per the action from BOF 61, UKBB Chair, Liz Kirkham, had also been invited but was unable to attend this meeting.

The Chairman invited new members Sue Threader, Kevin Dentith and Malcolm Cattermole to introduce themselves in the usual way:

Sue has been the Bridge Clerk for Rochester Bridge Trust for 15 years before which she worked for local authorities and consultants. She outlined a brief history of bridges over the Medway starting with the first Roman bridge built in 43 AD which, from the 6th Century, was maintained by contributions from local parishes. The Roman bridge was replaced in 1381 and shortly thereafter the Trust was established to support the bridge via various land ownerships and endowments. The mediaeval bridge was demolished in 1857 and replaced by a design by Sir William Cubitt. In turn this was replaced in 1914 by a bow string truss, now known as the old bridge. The new bridge and a service bridge were built in the 1970s and all are presently in the middle of a major refurbishment contract. As well as the three bridges, the Trust is also responsible for a mediaeval chapel. The Chairman thanked Sue for her introduction, noting the innovative procurement and funding initiatives dating from the 13th century.

Kevin Dentith is the Chief Bridge Engineer for Devon County Council (DCC) and chairs the ADEPT Bridges Group. Kevin noted that Devon also has a bridge trust; for the 27 span Bideford long bridge which pays DCC £1000 per year as a contribution towards its maintenance. Kevin’s career started in 1979 as a draughtsman with the Devon Sub-Unit of the South West RCU before he joined DCC’s graduate training scheme. Devon has the largest stock of any of the English counties and also the largest in-house design and maintenance teams, with any additional support coming from Jacobs as a framework consultant. One of Kevin’s priorities in Devon is dealing with attempted suicides which last year saw 72 incidents on one bridge alone, each of at least three or four hours duration. He was about to increase the parapet heights at this site. Among his ADEPT priorities are working relationships with neighbours: Canal and River Trust, Network Rail and Highways England and the poor take-up of BICS.

Malcolm Cattermole works for Forestry England (FE, previously the Forestry Commission) and was attending this meeting as a potential new member of BOF. With a background in M&E engineering, Malcom had joined the Commission 11 years ago. He gave a short presentation illustrating his organisation and some of his bridge stock. Forestry England was created in April 2019 along with five other organisations including separate bodies for Wales and Scotland. The FE is split into six districts, as well as a national team, but their *raison d’être* is to extract timber and its roads and bridges are primarily for that purpose with any recreational use only incidental. The current stock is as below:

	England	Scotland
Footbridges:	476	560
Road Bridges:	560	1152

Some bridges are used only infrequently (occasionally once in 20 years) and use is made of Bailey and other temporary bridges. Malcolm noted that most of his day to day engineering problems were related to maintenance. He cited some interesting examples, including an aerial walkway, a suspension bridge, some tram-rail filler beam decks and a stress-laminated timber arch over a public highway that had recently been hit by a truck with its tipper unit in an upright position. The Chairman noted the importance of timber bridges in the drive towards zero net carbon and welcomed the input that FE might give to BOF in this area.

3. BOF 61 Minutes

a. Accuracy

Item 1, page 2, paragraph 5: Replace “Bridges” with “Bridge”.

Item 4: title: Replace “61” with “60”.

Item 7f: To be redacted for version of minutes to go on the public section of the BOF website.

Item 7i: Replace “...Structure Toolkit and Bridge Performance Indicator Guide with no DfT funding.” with “...Structures Toolkit funded by DfT and Bridge Performance Indicator Guide, not yet funded by DfT.”

Once the above amendments have been made, the minutes can be uploaded to the BOF website.

ACTION 1: Paul Fidler

b. Matters Arising

The Chairman welcomed the new format Action Update sheet designed to streamline this item.

Action 1: Paul Fidler noted that he did not have the Ewan Angus presentation and so it had not been uploaded to the BOF website.

ACTION 2: Richard Fish/Paul Fidler

Action 5: Procurement Innovations

It was noted that the BOF 62 agenda had not included a specific item on procurement innovations but it was agreed that this should be re-scheduled for BOF 63. Sue Threader offered to present on the detail of the Rochester Bridges refurbishment contract and others also expressed a wish to contribute.

ACTION 3: Richard Fish

The Chairman reported that the Centre for Digitally Built Britain (CDBB) were working with Kings College, London and the Construction Leadership Council on a Procurement for Value research project which might also be of interest.

Action 10: Eastham Bridge Collapse

The Chairman thanked Richard Fish for instigating the FoI request from Worcestershire County Council (WCC) but questioned why this should have been necessary. Kevin Dentith suggested that this would not have been the case for all local authorities but suspected that it reflected the extent of externalisation in WCC which had left only a small client team who relied heavily on framework consultants.

The Chairman repeated previous calls from BOF for an independent body (such as RAIB for rail bridge collapses) to investigate highway bridge collapses in the UK. Neil Loudon noted that the idea of independent investigations was gaining traction not least following Grenfell Tower and was also being considered by SCOSS. Neil also commented that the risk of bridge collapses was being given more attention by politicians since the Polcevera collapse in Genoa last year.

Richard Fish proposed that SCOSS would be a strong ally in this campaign and suggested that a visit to BOF 63 by Alastair Soane would be timely, especially if this could be combined with the ORR attending the same meeting.

ACTION 4: Richard Fish

It was also agreed that all members of UKBB would continue to lobby for such a body with a view to making UKRLG and Governments aware of the need.

ACTION 5: BOF UKBB Members

Returning to the WCC FoI issue, Kevin Dentith agreed to make an approach via ADEPT and his contacts in Jacobs to see if Eastham could be a pilot for such a body.

ACTION 6: Kevin Dentith

Action 17: Conference Feedback

Richard Fish's short report based on information from José Sanchez was noted. Keith Harwood reported that he had also been in discussions about next year's conference Pecha Kucha.

Action 27: Lift Bridge Hanger Failure

Andy Featherby reported on the failure of the end of a steel hanger rod when an overhead bascule bridge was being operated by a member of the public. A temporary repair was initially made before hangers were replaced on all 10 CR&T bridges of a similar design, now with a modified end detail. A 20 to 25 year planned replacement programme was also now in place.

4. DMRB Update (Not SoBI as agenda)

Although the Highways England report into the State of Bridge Infrastructure had been scheduled as an agenda item, Neil Loudon correctly pointed out that this had already been presented at BOF 55 in January 2018.

Neil then gave an update on the DMRB re-write using the presentation he was due to give at the NCE Bridge Conference taking place on 25th and 26th November. Neil reported that the re-write programme was on target for publication by the end of March 2020 with all new documents also being approved by Transport Scotland, Welsh Government and Transport Northern Ireland. He described the new consistent style and format and noted that there were no longer Advice Notes on a stand-alone basis; "advice" would only be given in respect of a specific "requirement" in the new system.

Public access would remain to older DMRB documents dating from 2002 via the DMRB web-site with older ones available on request. There were other documents still to be drafted such as the implementation of CIRIA reports on Safety Critical Fixings and Hidden Defects. Following the DMRB, the next project would be a re-write of the MCHW which should start early in 2020.

The Chairman thanked Neil for his presentation and invited questions. Keith Harwood asked about the need to keep the TA Schedule up to date. Neil replied that eventually there would be three types of TAS: for design, assessment and temporary works. Asher Lawrence-Cole asked how the new DMRB would relate to the wider implications of Climate Change. Neil replied that all such topics would be embedded across all DMRB documents.

5. BOF Grand Challenges – Progress Report

Keith Harwood gave a short presentation on the current status of the BOF Grand Challenges in their agreed format. These had also been presented at UKBB where he had appealed for key facts to support the Challenges, as he had at BOF 61, although with little response to date. The Chairman asked everyone to help move this forward.

ACTION 7: All

It was agreed that there was a need to improve the graphics of each, and to obtain quotes from the Chairs of BOF and UKBB.

ACTION 8: Keith Harwood/Richard Fish

Jo Geddes noted that Network Rail have Challenge Statements which might be used. The Chairman recalled that these had been presented at an earlier BOF by the previous Network Rail representative, Rob Dean. Ioannis Mavvidis asked which organisations had signed up to the Grand Challenges concept and how they were to be publicised. Neil Loudon suggested that there was work across the bridge owning sector and saw them being applied across various risk related topics such as collapses, scour, flooding etc. In terms of promulgation, the Chairman suggested that this should be by whatever means possible and also asked Richard Fish to discuss options with Helena Russell.

ACTION 9: Richard Fish

6. DfT Transport Research and Innovation Board (TRIB)

The Chairman introduced the TRIB team: Asher Lawrence-Cole, Ionassis Mavvidis, Jo Geddes and Tassos Andrianopoulos. He also expressed the view that there was an opportunity for mutual support between BOF and TRIB.

The TRIB presentations began with Ionassis Mavvidis who described the background to the Board which had been formed in 2018. Ionassis stated the following aims:

- Connect leadership and activities
- Leverage funding
- Facilitate demonstrator projects
- Global engagement
- Create a line of sight to Government priorities

There are five themes:

- Transport Infrastructure
- Transport Integration
- Transport Data
- Transport decarbonisation
- Impact on health, well-being and inclusivity

Jo Geddes described the TRIB project focussing on bridges, recognising the importance of engagement with bridge owners. A model had been developed using data from the Laing O'Rourke Centre in Cambridge off-site construction team which ultimately could be used to cover the full life cycle of a bridge.

The Chairman developed this theme, initially responding to a question from Trish Johnson regarding previous initiatives such as Constructing Excellence and M4i. He suggested that evidence was needed to establish the benefits of off-site, as opposed to traditional, construction. KPIs were easier to identify with other construction sectors, particularly schools, (covering cost, programme, quality and safety) but even here performance measurement was inconsistent. As for bridges, the need was to establish comparators other than traditional cost per square metre of deck but this required contractors to be open about their pricing which in turn must lead to improved procurement procedures.

Tomas Garcia agreed that procurement was the issue, commenting that it had turned from a practice of enabling to one of dictating process. The Chairman agreed and, responding to Jason Hibbert's question on the issue of productivity (which had been a key part of the Mark Bew presentation at BOF 53 in 2017), confirmed that this was part of the model.

Paul Thomas emphasised that the primary need of BOF members was maintenance and this should be included in the TRIB work. Sue Threader noted that a good indicator would be the carbon savings between regular maintenance, major refurbishments or reconstruction. Jo Geddes agreed that this was a point which should be considered.

Neil Loudon questioned how bridge projects could be considered in isolation when they were generally part of a larger road or rail project. He also referred to a NAO investigation of two bridge sites, one in the north-east and the other in the south-west, which had found it very difficult to make comparisons. Tomas Garcia also noted that different clients might have different priorities such as minimising disruption or optimising future maintenance interventions, making comparisons very difficult. Henry Dempsey added that certain structures should be considered as strategic where the primary measure was likely to be accessibility.

Tassos Andrianopolous then presented on the second TRIB project, looking at Construction Strategy Targets for 2025 as being considered by the various industry boards and citing the Construction Leadership Council as an exemplar. This project's

aim was to create a catalogue of references and standards in use for all aspects of bridge building and maintenance to inform future activities.

Tassos referred to other parties such as the Infrastructure Client Group, the National Infrastructure Commission and the Association for Consultancy and Engineering. The intention was to review all their activities, looking at areas of duplication or gaps, before aligning with TRIB opportunities.

The Chairman thanked the TRIB team for their input into the discussions and looked forward to maintaining contact and future collaboration on areas of mutual benefit. Asher Lawrence-Cole welcomed the link between TRIB and BOF which had already proved to be very productive and sought and obtained the Chairman's permission to stay for the rest of the meeting. He also agreed that the TRIB presentations could be uploaded to the BOF website.

ACTION 10: Chairman/Paul Fidler

7. BOF Profile and Visibility – Review and Discussion

The Chairman welcomed Helena Russell to the meeting and invited her to introduce herself and present her views on this subject.

Helena summarised her career to date; a civil engineering graduate with three years in industry before joining New Civil Engineer as a reporter where she spent nine years before being appointed as the first editor of Bridge Design and Engineering magazine. After holding this position for almost 20 years, Helena had recently become a freelance journalist.

Helena then considered the who, what and why of BOF; beginning with her assessment of the current BOF website, with the following observations:

- It is old fashioned and out of date
- It is inwardly focused, not looking to engage with any external interested party
- It is basically a repository of information
- In summary, it is dense, basic and static; and has no images.

Helena then went on to suggest what the website *should* do, including improved generic contact details, a list of BOF member organisations and social media feeds. A fundamental decision was also needed as to who is the target audience for the site.

The meeting then split into groups as a mini workshop to discuss these points, none of which were disputed. It was agreed that options for improving and/or relaunching the website should be considered.

ACTION 11: Chairman/Paul Fidler

Helena then turned to social media. A show of hands revealed that most of those present used Facebook for purely social purposes, most also had a LinkedIn profile but only three used Instagram. She noted that the BOF Twitter feed was reasonably successful with over 300 followers. Richard Fish noted that he ran the BOF Twitter handle but admitted that he tended to be reactive rather than proactive and acknowledged that there was more that could be done. Helena explained how Twitter could quickly expand its reach through “tagging” but also suggested that any Tweets should be opinionated in order to provoke responses.

Again, a mini workshop agreed that more should be done to promote BOF on Twitter but also raised the option for a possible closed LinkedIn group. On the latter, it was agreed that this should be established but Richard Fish felt that he did not have the capacity to run this effectively and called for a volunteer to do this on behalf of BOF.

ACTION 12: All

Discussions then extended into ways that BOF could feature more in the technical press. As an example, the Chairman cited the Grand Challenges which he would like to see getting higher visibility. Helena explained the process through which this might be achieved whereby she could act as a link between BOF and the media. This might entail her pitching a BOF idea to a publication and, if successful, the editor would then commission her to write it. It was agreed that this suggestion should be pursued.

ACTION 13: Richard Fish

The Chairman expressed his gratitude to Helena for her helpful advice and hoped that it could develop BOF’s profile. Helena agreed that her presentation slides could be uploaded to the BOF website.

ACTION 14: Paul Fidler

The discussion then continued around BOF and the Grand Challenges concept with Asher Lawrence-Cole wishing to understand BOF’s genesis and funding. The Chairman provided the account of the initial DfT funding, then this being withdrawn as part of a review of DfT expenditure and how BOF had moved to become a subscription based organisation. He also explained the ties with UKRLG and UKBB and the fact that DfT was theoretically part of BOF via Steve Berry’s team.

Asher pointed out that there was much interest in the broader subject of resilience and that a small team had been formed in DfT to develop resilience based research and policy development. Asher asked if he could be kept up to date with progress on the Grand Challenges initiative and maintain links with BOF.

ACTION 15: Chairman/Richard Fish

The Chairman proposed that a “White Paper” type of document could be prepared to support both DfT interest and the wish to raise BOF’s profile.

ACTION 16: Chairman/Richard Fish

8. Feedback from meeting with BD&E Editor re Bridges 2020

Richard Fish reported on a productive meeting with José Sanchez regarding the 2020 Bridges Conference to be held at the Ricoh Arena in Coventry on 12th March. The organisers were keen for BOF to be a key player once again and it had been agreed that a presentation on Grand Challenges would be welcome. José had also agreed to host a special BOF on the day before as in previous years. His main innovation for next year was to extend the conference to a second day (Friday 13th March) and host a number of workshops, possibly developing ideas for implementing some of the Grand Challenges. It was agreed that discussions should continue ahead of March 2020 regarding the format of BOF meeting, Conference and Workshop.

ACTION 17: Richard Fish

*Post meeting note: Following an email poll of BOF members, the overwhelming preference was **not** to hold a BOF meeting on March 11th but to make the proposed workshop on March 13th a nominal BOF meeting, albeit with others able to participate. José Sanchez has been advised of this decision.*

Keith Harwood noted that he had also had conversations with José Sanchez and ideas were being developed on a Pecha Kucha theme.

9. Bridge Collapses – Update

Richard Fish listed the following significant bridge collapses leading to fatalities that had occurred since he had given his presentation at the March Bridges Conference:

- March: Mumbai Footbridge
- April: Moju River, Brazil
- August: ATBU Footbridge, Nigeria
- October: Nanfang'ao, Taiwan
- October: Junagadh, India

Richard also recommended a report by the US NTSB (available on line) into the collapse of the FIU footbridge in Miami in March 2018 which showed staggering levels of complacency on site and implicated the bridge's designer, Figg. There had also been two excellent BBC programmes (one television, one radio) to mark the anniversary of the Polcevera collapse in Genoa in August 2018. Richard recommended that BOF members should catch up with these respectively on iPlayer or as a BBC Sounds Podcast.

Discussion on the continuing spate of collapses further emphasised the points made earlier in the meeting on the importance of knowledge sharing and the need for independent investigations into UK road bridge collapses, along the lines of RAIB for rail bridges or using the model of the NTSB in the USA. Richard Fish will ensure that

this remains under discussion at UKBB and also that Liz Kirkham is asked to raise the matter at UKRLG.

ACTION 18: Richard Fish

Asher Lawrence-Cole noted that the Genoa collapse had raised concerns within DfT and was a factor in the establishment of the resilience programme mentioned earlier. He also agreed to raise the issue of independent investigations. Another body which would also be interested was the National Hazards Partnership.

10. Update on Current Bridge issues and/or Research

The Chairman invited BOF members to give an update on any pressing issues or involvement in research projects.

a. Canal and River Trust

- i. **Guildford Footbridge Collapse:** Andy Featherby referred to the collapse of a minor footbridge during flood conditions.
- ii. **Vehicle Impact on Parapets:** Andy referred to a specific bridge which had been hit on a regular basis and was now being monitored by cameras. Kevin Dentith noted that DCC had also trialled this and agreed to share with C&RT.

ACTION 19: Kevin Dentith

The Chairman suggested that this was similar to methods warning of over-height vehicles approaching low headroom bridges. Neil Loudon suggested that a bigger problem was identifying the wider implications of overloaded HGVs. He will advise on Highways England/DfT discussions at BOF 63.

ACTION 20: Neil Loudon

b. Highways England:

Neil Loudon reported on the work of the HE Innovation and Research Team covering bearings, joints and concrete repairs, all part of the drive to assist with, and improve the quality of, inspections.

c. Railway Paths:

Paul Thomas reported that the Railway Paths project on the linseed oil treatment of wrought iron had not won a BCIA award but he saw this as a good example of the reducing carbon agenda.

d. ADEPT

- i. **Structures Toolkit:** Keith Harwood noted that this will soon be available via the CIPFA and UKRLG websites and was to be promoted through webinars and with a slot at the 2020 Bridges Conference. Keith agreed to present on this at BOF 63.

ACTION 21: Keith Harwood

- ii. **C&RT:** Kevin Dentith reported that negotiations were ongoing regarding costs for access for inspections which he hoped would be resolved by the end of the year.
- iii. **Boundary Issues:** Discussions on the split in maintenance responsibilities were also underway with Highways England.
- iv. **Exeter University Debris Induced Scour:** To be the subject of a workshop at Clifton Bridge.
- v. **Scour:** ADEPT/HE discussions underway on BD97 redrafting.
- vi. **BICS:** Concerns regarding poor uptake of the scheme and some alternatives being considered by ADEPT members. This was due to a number of issues not least the amount of time needed to prepare and submit an e-portfolio. Jason Hibbert endorsed this, suggesting that up to 300 hours was needed in the preparation of the e-portfolio. Neil Loudon hoped that a meeting could soon be arranged with LANTRA and it was hoped that the modularisation of the scheme would soon be launched. Neil noted that the plus point was that the need for Inspector competency had clearly been demonstrated. Kevin Dentith also expressed concern over the financial implications, noting that some local authorities paid inspectors at minimum wage rates and would not cover costs arising from achieving and maintaining BICS. Asher Lawrence-Cole pointed out the wider issue of defining and assessing competence with respect to professional engineering institutions, and this was partly reflected in how little some employers recognise the value of competence or chartership. The Chairman asked for BICS and other competency schemes to be added to the BOF 63 agenda.

ACTION 22: Richard Fish

e. Welsh Government

- i. **Resilient Materials for Life (M4L):** Jason Hibbert noted that there was to be a three day conference in September at Churchill College, Cambridge.
- ii. **Near Miss: Concrete Repair Scheme:** Jason reported on this work on an M4 bridge in which too much concrete had been removed as part of a half-joint repair scheme, resulting in an emergency closure of the motorway. This was basically a communication problem and had been reported to SCOSS. Jason agreed to present on this at BOF 63.

ACTION 23: Jason Hibbert

f. CSS Wales

Jim Hall reported on changes within the CSS Wales Bridges Group which would mean that Osian Richards would be succeeding him as BOF representative from the next meeting, although Jim pointed out that he would be the nominated substitute for Osian. He also noted that CSS Wales were also working on alternatives to BICS. The Chairman thanked Jim for his contribution and commitment to BOF over the last few years.

g. Big Bridge Group

Trish Johnson reported on a recent International Cable Supported Bridge Operators Association workshop which had discussed suicide prevention, the use of drones and dealing with ice accretion on cables.

h. London Underground

- i. Cast Iron Bridges and Elements:** TfL (LUL) have an ongoing research programme.
- ii. Service cables on structures:** There is an ongoing issue of works requiring diversion of service cables, even those now redundant and belonging to LUL, all of which leads to works cost increases.
- iii. Holes in Tunnels:** There have been a number of instances where third parties have cut holes in tunnel roofs; not always from highways but also from inside buildings.
- iv. LIDAR Tunnel Inspections:** Early results from trials had seen vast amounts of data but not enough information. There was also an issue of ownership of the data.

i. DfT

- i. TRIB:** Tassos Andrianopoulos asked if he could pose specific questions to BOF members. This was agreed and would be via Richard Fish.

ACTION 24: Richard Fish

- ii. BridgeCat:** Asher Lawrence-Cole reported that this project had been extended and Gaist had been commissioned to develop an App linked to ultrasound sensors for scour monitoring, particularly at high risk sites. They had also been asked to consider the use of accelerometers as part of the sensor technology. The Chairman and Kevin Dentith noted that this was also part of research programmes at Cambridge and Exeter Universities respectively.

j. CUED/CDBB

Paul Fidler reported on long term monitoring that had been installed in new bridges in Staffordshire to measure whole life performance. The Chairman also noted that funding had been secured to extend the satellite monitoring projects.

11. Numbers and Timing of BOF Meetings (per year)

After a brief discussion it was decided to continue with the current meeting dates: January, May, November for main meetings and the mini-BOF in association with the March Bridges Conference.

12.Future Meetings: Themes, Visits, Guests

It was agreed that occasional themed meetings should continue; carbon, maintenance, scour and resilience were suggested themes.

ACTION 25: Chairman/Richard Fish

The Chairman proposed that one of the 2020 meetings could include a tour of the new CUED National Research Facility for Infrastructure Sensing, possibly to coincide with the BOF 20th anniversary.

ACTION 26: Chairman

13.Any Other Business

- a) **Debris influence on scour:** Kevin Dentith drew attention to an event in Bristol on 6th November.
- b) **Grand Challenges:** Asher Lawrence-Cole agreed to discuss this further within DfT and to explore possibilities of associated EPSRC funded research.

14. Next Meetings

BOF 63: 28th January 2020 at Kings College, Cambridge.

BOF 64: 13th March 2020 at the Ricoh Arena (Grand Challenges Workshop)

BOF 65: provisionally 26th May 2020 at Kings College, Cambridge. *

ACTION 27: ALL

**Post meeting note: As this date is the day after the Bank Holiday and likely to be in half-term week, it was tested with members. As most have said that it is suitable, it is likely to be confirmed. For those that cannot make it, substitutes from your organisation will be welcome.*

15. Close

The Chairman closed the meeting with special thanks to our guests - the TRIB team and Helena Russell.

Richard Fish,
BOF Technical Secretary,
5th December 2019