address this in a moment, but you said a three-bore tunnel would avoid the need for any vent shafts, is what you identified in your slides? In fact, for example, the Channel Tunnel does have two vent shafts obviously on the landward sides, but necessary in order to drive the air, the fans, etc. for the control of the tunnels themselves, so it's not right is it that you would be able to avoid the need for vent shafts in a three-bore tunnel option that you're suggesting?

172. DR BAILEY: Well, that is an area that I've been asked to look at.

173. MR GLADWIN: We're not engineers in that way; if that's the reality, then that's the reality. But, I would suggest that that was necessary because of the length of the Channel Tunnel.

174. MR STRACHAN QC (DfT): Well, what I'll do, I'll ask Mr Smart to address that because he is the expert and not myself.

175. DR BAILEY: Absolutely.

176. MR STRACHAN QC (DfT): But I just wanted to understand whether you had looked at that, and what you're telling me is you're not sure or you haven't – okay. In that case, can I ask Mr Smart – we might as well deal with the – well, can I take it turn. We've got to first of all look at this question of the effects on the River Misbourne, Mr Smart, because the petitioners have raised a concern about the River Misbourne. If we could have up on the screen P7452 please? What I've asked to be put up on the screen, Mr Smart is the identification of where the current scheme crosses the River Misbourne. Obviously it's doing so below, so it's underneath the River Misbourne?

177. MR SMART: Yes.

178. MR STRACHAN QC (DfT): The two areas where the tunnel would pass underneath the River Misbourne, and if we go to the next slide, P7452(2), we see the measures that have already been taken into account as to how one tunnels in that area, and in that chalk, to control the effects of tunnelling?

179. MR SMART: Correct.

180. MR STRACHAN QC (DfT): You can see there the various measures that are

identified, the second of which is that one tunnels at a depth of two tunnel diameters below the riverbed, from the top of the tunnel. Low risk of tunnelling inducing settlement, but then mitigation measures are put in place to monitor the position in relation to the effects on lake levels and river flows?

181. MR SMART: That's correct, yes, and we believe that we're deep enough with our proposal that we won't affect the Misbourne, but that will be reviewed when we get geotechnical information and of course, the River Misbourne is an important amenity and is subject to the Protected Provisions under the Environment Agency. We have and will be talking to them and the Affinity Water to ensure that we don't affect the Misbourne or the aquifers in the area.

182. SIR PETER BOTTOMLEY: Sorry, Mr Strachan asked you what prompt decision might mean, what might it mean?

183. MR SMART: Prompt decision making? Well –

184. SIR PETER BOTTOMLEY: It says mitigation measures, which aren't – mitigation, you're going to monitor and presumably if ground settlement, lake levels sinking or river flows changing unexpectedly, to prompt decision. To underpin prompt decision making: what might you making decisions on?

185. MR SMART: Well, one of the key things we've got here is, you've heard us talk about the type of machine that we'll be using. So we'll be using close-face machine. The machine selection will be dependent upon further geological and geotechnical information, but we're anticipating, because we are in the type of chalk that Dr Bailey has talked about, where there are flints etc., that we would use the hybrid shield or slurry machine, that I think the committee are aware of, that I've talked about. It is basically making sure that the machine is driven at the rate that you minimise settlement.

186. SIR PETER BOTTOMLEY: So you're mitigating risk – you aren't mitigating the consequences of things going wrong?

187. MR SMART: You're mitigating that by monitoring the ground as you move forward and you can see the relationship between what the machine is doing and the face loss, and the settlement that you get at the surface so that if you were to – and I

should also add, we'll have better geotechnical information, so we'll be identifying in advance and we'll have boreholes, where we've been monitoring the ground water. We'll be able to, in advance of the machines coming into certain zones that might be potentially higher risk in terms of any settlement or any areas where we might have a problem with the ground, we will be able to more closely monitor those areas. The type of chalk that we're tunnelling through is not unusual. There's many examples, as I think Dr Bailey has already cited some, on CTRL, High Speed 1; the Thames Tunnel is in chalk; the Lee Valley Tunnel is in chalk at the moment. There are many other examples: the DLR to Woolwich Arsenal is in chalk and there are a couple of areas where recent tunnels, cable tunnels at Croydon and Willesden, where they've been tunnelling through SPZs in terms of aquifer, all controlled in terms of how they minimise risk to aquifers and water courses. I think that Mr Blaine's evidence on the Colne Valley was suggesting that it was possible to tunnel through the chalk under the Colne Valley, at a relatively shallow depth without causing a problem to the aquifer.

188. SIR PETER BOTTOMLEY: When you say you need to tunnel down to this depth between the river bed and the top of the tunnel, is it going to be pretty close to two tunnel diameters or is it possibly more than that?

189. MR SMART: It's at least that, possibly more. I'd have to look at – we'd have to look at where the various layers of where the groundwater is in relation to our depth. If necessary, we could go slightly deeper but we're not anticipating that we would do that; we would have to do that carefully on the alignment because we need to meet a railway alignment. But it is possible to go slightly deeper.

190. MR STRACHAN QC (DfT): Could I just ask for P7453(1) to be put on screen, because I think one of the concerns was that the promoter hadn't looked at these things already or not in sufficient depth? We have here a letter from the Environment Agency dealing with the River Misbourne crossing, and Mr Smart, we can see that the EA is commenting in the third paragraph on the number of avoidance and mitigation measures proposed in the design?

191. MR SMART: Yes.

192. MR STRACHAN QC (DfT): And then there's three identified. 'There's an issue in relation to potential significant effect on the proximity of the works to local public

water supply resources and alongside Affinity Water we should continue to provide advice to ensure a management strategy and mitigation measures are agreed, and you'll have to demonstrate that Affinity Water is able to maintain the resilience of public water supplies', do you see that?

193. MR SMART: That's correct.

194. MR STRACHAN QC (DfT): And then ultimately, 'Before we can approve applications in line with the protected provisions within the Hybrid Bill, we'll need to be satisfied that all potential risks to the river and surrounding environment have been mitigated, and this will need to be supported by evidence from your ground investigation programme and we'll continue to provide advice to ensure the proposed mitigation will be acceptable and approvals can be issued.' So, Mr Smart, in general terms you're referring to the protected provisions, but the EA is identifying here that they will continue to provide an approvals process before anything occurs, to ensure the protection of the River Misbourne and the water supply in the area, is that how it would work?

195. MR SMART: Indeed, as one would expect, yes.

196. MR GLADWIN: May I ask a question?

197. CHAIR: When Mr Strachan has finished, you have a right to question Mr Smart.

198. MR STRACHAN QC (DfT): Mr Smart, you've identified that the tunnelling in this type of material has occurred in a number of places. Can I just turn it on its head and ask you the question of whether a resort to a three-bore tunnel other than for tunnelling under the sea or, indeed, a mountain, whether that's a technique that's used in any other tunnels that you're aware of in this country?

199. MR SMART: Not that I'm aware of, certainly in this country, it is the Channel Tunnel; and that is because, of course, it goes under the Channel and there is no other way which they can deal with it, realistically, because the Channel itself is 60 metres, probably, at the deepest part; and the Channel Tunnel itself is 40 metres below that.

200. MR STRACHAN QC (DfT): We know the broad order of costs the petitioners put forward of an extra £500 million in order to create a third bore. Can I just take you

to one of the extracts from the options for additional tunnelling which the petitioners put in? A1210(2)? This is a report from January 2012 where additional options for a tunnel through the Chilterns were considered. One of the options that was looked at was a third bore, so clearly something that has been considered and we can see there, halfway down the page, a continuous tunnel with a third bore, between the main bores, to facilitate evacuation and access – in this case, passengers would be evacuated into the central bore, would mean emergency service access would only be from either portal, requiring them to travel more than six miles underground to reach an incident, require a complex and extensive ventilation system, to control smoke in the event of a fire; we don't consider it appropriate for emergency services to be required to travel this far underground to reach a site of an incident, if ventilation shafts are a feasible option, and then there is reference to the substantial additional construction costs and the – you'll need to have a dedicated emergency rescue service. Can you just comment on that, Mr Smart, in relation to the Channel Tunnel and the use of vent shafts and what you need for emergency services if you were to create a third bore?

201. MR SMART: Yes, could we go to the petitioner's slide A1194? Sorry, 38. Which I think pretty much shows what the Channel Tunnel does. The reason it is like that with the Channel Tunnel is because, as I've said, the depth of water that the tunnel is below the seabed is you can't actually have a vent shaft in the middle of the tunnel section under the sea, which is about 38km, the section under the sea. So, if I can just point, the tunnel on 'B', that's what they call the service tunnel in the Channel Tunnel, and that is in fact where there is a maintenance tunnel where there is a railway and they have special vehicles that travel up and down that railway, man riders. If you evacuate into that, that needs to be pressurised, because if you open the cross-passage doors, that would be on the Channel Tunnel, four, because of the additional bore, you still have to pressurise that rescue tunnel, or service tunnel and also, you have to control smoke in the running tunnel as shown as 'A' on this slide. So this means that on the Channel Tunnel, I think it's about three kilometres in from the portal on the French side, and nine on the English side, there is deep shafts and they do have fans, bigger fans than we would have because of the distances they have to control air at a critical velocity, to pressurise the tunnels and to control smoke. So that means that, if we were to use this scenario, we would still have to have two vent shafts about a quarter of the way in from our portals, to do this; and as already pointed out, this is a very, very expensive solution.

202. So, as has also been mentioned by Mr Strachan, the only way you can get into that tunnel, really, is by specialist plant and equipment. So, Kent Fire Brigade, who service the Channel Tunnel from the UK side, have specialist equipment, which they go in, down that tunnel, should they have to fight a fire somewhere along the Channel Tunnel. But, because of the difficulties of that, they often don't, and that's why there have been incidents with – at least two incidents in the Channel Tunnel with trains on fire, where there was serious damage to the tunnel itself, and they had to close it for quite extensive periods of time due to the very high temperatures that are generated with a train on fire in a tunnel. So this is about getting a safe – providing a safe method for such a tunnel, but this is because of the peculiarities, you are under the sea in the Channel Tunnel. It is not what you would adopt for a safe method of passenger access, or indeed, fire fighting in a tunnel under land, where you would adopt the same principles as High Speed 1, where you fight the fire from a shaft and you take passengers out on the adjacent incident tunnel.

203. MR STRACHAN QC (DfT): That's what I was going to ask you, Mr Smart, because I think the petitioner is suggesting a third bore is a safer option than the proposal we have in relation to twin bores with vent shafts one way, can you just comment on that?

204. MR SMART: Well, it's not safer. It's a different way of achieving a safe scenario. The other thing that's important to mention, you can't just look at the infrastructure that's provided, because when you've got any tunnel scenario in railway with passengers and, indeed, maintenance workers that are in there, you have to look at the tunnel in conjunction with how it operates. So there are operational procedures for emergency egress and access; and that leads to an emergency plan. So you have to look at all of that together. But I don't think there's any hierarchy of saying, 'This is a safer method'. This is a more expensive method of achieving safety in a tunnel, where one is – if you like – forced to do this because of the fact you're under the sea for 38km.

205. CHAIR: The vent shafts, how far apart are they on the existing tunnel in the Chilterns?

206. SIR PETER BOTTOMLEY: 2 or 3 kilometres?

207. MR SMART: Yes, one of the criteria is, in talking to the London Fire Brigade on

High Speed 1 for the vent shafts, there's a certain amount of time, if they have to go down to fight a fire from a vent shaft, they have to take breathing apparatus and equipment with them. There's only so far they can actually reasonably travel to get to a fire. What we did on High Speed 1 was provide certain trolleys and things at the bottom of the vent shaft that they could pull their equipment with them. So the criteria for the vent shaft is about a number of things: it's about the fans, it's about pressure relief. It's also about reasonable access for the fire brigade and so there is only so far.

208. CHAIR: So it would be possible, if there was an incident on the train, that they could use two vent shafts at both ends, and send people down both ends?

209. MR SMART: They could, they could do that. And the other thing about using a vent shaft, of course, is that it does mean the fire brigade can access the tunnel in the incident using their normal appliances. They don't need any specialist equipment to be used, as indeed, you have to do on the Channel Tunnel.

210. MR CLIFTON-BROWN: Can I ask the question, raised in the earlier evidence session, about these 18 trains an hour, which is quite a high frequency. If there is a fire, how quickly can you bring the opposite carriageway to a halt to start evacuating the passengers?

211. MR SMART: Yes. That is a very good question, because that does get you to the point that says, 'How quickly can you evacuate the non-incident tunnel' – evacuate with trains I mean, 'In order to get people across?' Now, the longer the tunnel is, the longer that time is. So, of course, you are holding passengers – you've got longer before they can get into that tunnel, and you've got to move them down a walkway, away from the smoke which is being blown away. Now, it is quite quick, because the way it works is, you only have one train in any vent section – so between two vent shafts, you can only have one train. That does, of course, affect the journey time, which we have talked about in other petitions about how that will affect – that you can't bunch up the trains because in that 3km, you can only have one train. Not massive, because the trains take quite a long time to stop at the speed they're going anyway.

212. So, it can, under a reasonable length of tunnel, you can evacuate the tunnel – sorry, you can stop trains in sufficient time, to be able evacuate people into the non-incident tunnel. Now, the longer that tunnel, yes, of course, the more problematic that

can be, which is where you get to the point that we've talked about in other petitions about the intervention gap, which is where you can try and drive a train to, if it was on fire. You have to be able to give a reasonable answer to, 'What happens if a train came to an unplanned stop on fire?' Can you get people out? That's about the cross-passages, which we have at 380; and about the way you can blow smoke away from the passengers and get them away safely. If a train is on fire and is moveable, part of the SRT, Safety in Rail Tunnels, is that the trains with 15 minute fire compartmentalisation can travel for 15 minutes at 80km/h which gets you to 20km/h, at an intervention point where you would ideally evacuate the passengers in the open and away from the railway.

213. MR CLIFTON-BROWN: Okay.

214. MR STRACHAN QC (DfT): That answer, I know, will cross over into what you're considering in relation to the other Chilterns tunnels cases, so I will leave it there. Just on – there was one factual question, Mr Smart, about HS1 and the number of trains that it currently takes, which I think Mr Gladwin was indicating were 10 trains per hour. What is actually its designed capacity?

215. MR SMART: Its designed capacity is 20 train paths an hour. Of course, when you put a timetable around that, 20 train paths an hour is very challenging, but if you sent the trains up the trace, one after the other, you'd get 20 train paths an hour. I think I would have to check, that the maximum that they do at potential peak is 14 train paths an hour at the moment, but the peaks depend on the domestic and the international piece coinciding.

216. MR STRACHAN QC (DfT): And, Mr Smart, Dr Bailey acknowledged he's not an tunneller as such; can I just ask you to confirm, so far as the tunnellers who have looked at these appraisals – and we know the Chiltern tunnel other options that have been put forward by Dr Blaine – has anyone else suggested the three-bore tunnel, who is a tunneller, as a sensible option for this part of the scheme?

217. MR SMART: No.

218. MR STRACHAN QC (DfT): Those are all the questions I had for Mr Smart.

219. CHAIR: Just pick up on another point: we heard earlier about lighting, presumably there's no lights on this railway?

220. MR SMART: There's no lights on this railway. There's lighting in tunnel; you do need it in tunnel for maintenance and in the event of an emergency, you have to light a tunnel, but not out in the open.

221. CHAIR: And maintenance at night, noise?

222. MR SMART: Maintenance at night happens at particular locations, so the maintenance that is required is not noisy. There was a reference to rail grinding. Now, modern grinding machines travel reasonably quickly; they can do 7km grinding a shift, because you're not taking a massive amount out of the rail, it's a shallow grind. You can do 7km in a shift, and you wouldn't necessarily be grinding every year. Potentially you might, but that's the whole line. So any one place on the line might not have any maintenance happening at all. A plain line track in the middle of the country has very little, just basically inspect it. So, I think I answered the question, hopefully, sir.

223. CHAIR: Any other questions for Mr Smart?

224. MR STRACHAN QC (DfT): No, that's it.

225. CHAIR: Mr Gladwin?

226. MR GLADWIN: You want to go first?

227. DR BAILEY: Okay, just a couple of questions, really. Just for clarification, when the figure of two tunnel diameters in terms of the minimum depth, what diameter are we talking about in a tunnel?

228. MR SMART: We talking about an internal diameter of 8.8 metres.

229. DR BAILEY: So, we're talking about an 18 – a minimum of 18 metres below the surface?

230. MR SMART: Yes, and through the Chilterns, our deepest shaft is about 50 metres, but we're generally about 30 metres from the surface, as an average figure, depending on what the ground levels.

231. DR BAILEY: As an average figure, but the fact that I use the original figure of around about 22 metres – 20-22 metres – at a crossing point at Chalfont St Giles and the fact that we know that the geological section is in a state of – it's basically what's referred as solifluction chalk, which would be in a rubbly state down to at least 16.5 metres, means that we do only have 6 metres, potentially, of solid chalk between the crown of the tunnel and surface?

232. MR SMART: I've mentioned, we've got to do geological investigation, but there is 6 metres. There are areas on Crossrail and areas on High Speed 1 where we pass quite a lot closer to both the existing infrastructure such as sewers, a lot closer than that, without disturbing, so I don't see that as being a problem.

233. DR BAILEY: But sewers are actually located within, sort of, solid London clay, in the particular case of Crossrail, whereas here we're talking something which is basically a degraded, rubbly chalk.

234. MR SMART: They're not always, because sometimes they're in the Lambeth groups, etc. but they can be in clay, I do agree. But because we're using close face machines, and therefore we can very closely control the movement, we're not anticipating there's any problem; and indeed, there's been evidence given by petitioners on PBA, who have acted on behalf of the Chilterns, that in the Colne Valley, they would have no problem in going through weathered chalk under the Colne Valley with the slurry machine that we're proposing. And, modern machines are designed to cope with this type of scenario; that's where we are with tunnelling now. Indeed, in Kuala Lumpur, they've just finished tunnelling with variable density machines through some very challenging cash limestone, where you actually have solution hollows and fissures, as well as competent limestone, so that's exactly what the machines are designed to cope with and the tunnels are also gasketted and they're sealed, so this is a part of why we choose the machines that we have.

235. DR BAILEY: Have HS2 actually drilled any exploratory boreholes along the route so far?

236. MR SMART: Yes, we have started. I can't confirm where we are in relation to putting down boreholes in situ and laboratory testing in the Chilterns but we have started, and I can confirm, if the committee would like to know, when we anticipate

doing our first boreholes in that area, but we have started up in the Birmingham area.

237. DR BAILEY: So to date there hasn't been actually any geological investigation along the route through the Chilterns?

238. MR SMART: No, no, there's been a geological investigation based on the published records, the national records of the British Geological Survey, which have all the national records. That isn't just desktop, because that record does hold records of actual boreholes, so it's not as if it's just done from geological mapping; there's actually boreholes, but it's the national archive.

239. DR BAILEY: Can I point out therefore that since the area around Aylesbury Wendover was last mapped, it's over 100 years, and geological principles have moved on somewhat since 1922, when the memoir was published.

240. MR SMART: Well, I do think there's probably been people who have drilled some boreholes in that time, in the last 100 years, because of –

241. DR BAILEY: There are, because the water companies, and those of the boreholes that we've accessed.

242. MR SMART: Well, that's presumably the same archive material that we've accessed.

243. DR BAILEY: Just as a final comment on this, and I appreciate that the tunnelling machines are perfectly capable of tunnelling through the chalk on that, one of the things that is absent from a lot of the geological maps right the way through the Chilterns is any geological faults; these tend to be not mapped because the Chilterns is either vegetated or has urban conurbations built on top of it. From my own experience, every cutting that I've seen through the Chilterns over the last 35 years, has been faulted quite considerably, and therefore I just wondered – that obviously will have an impact on both tunnelling and also on the aquifer and water flow through the aquifer. I was just wondering whether any consideration has been taken for potential faults, particularly in the area in that Wendover, Beacon Hill area, because that is one of the most likely areas where faulting will be encountered?

244. MR SMART: Yes, that's a very good point, and that will be identified as a risk

and that will be part of the information that will play into our plan for where we put boreholes. So in those areas, we will probably have a higher density of bores, to investigate those riskier areas, if I can use that, than perhaps other areas. So yes, I do understand that, and that's something that we would take into account.

245. DR BAILEY: Okay, thank you very much.

246. MR GLADWIN: Can I ask a couple of questions? Mr Smart, it seemed to me when you were talking about Chalfont St Giles, it was tunnelling on the precautionary basis: well we're going to monitor this; we're going to monitor that. What you didn't explain was, if your monitoring then identified a problem what you were going to do about it? Surely, if you're designing a tunnel like this, wouldn't you be better to look at what the problems are and get the alignment of the tunnel correct before you start tunnelling? The whole thing seems to be backwards? I spent a bit of time in engineering and this seems to be like doing a small engineering job where we go in top down; any time we did a big one, we went bottom up? That seems to be the major problem. Now, if you're taking somewhere like Chalfont St Giles, what happens – you put a tunnelling machine under there; you've got maybe five or six metres of competent chalk; you've got rubbly chalk above it, all that's – the tunnelling machine is going to be shaking the ground isn't it? It's going to have vibrations and what is the impact if you're going through 16 metres of rubble? Are we going to get a drop of 2cm, or a drop of 4cm, or a drop of 2 metres? That doesn't seem to have been taken into account in designing where this route is going.

247. MR SMART: Well, yes it has, because based on the geological information and the bore hold records in the national archive, we have designed the tunnel for the best alignment, both for the railway and indeed the material that we are tunnelling through. Now, as has already been said, we are about to embark on some very extensive geotechnical investigation across the whole route, which informs the decision that we've made and, in the event of some really difficult ground, it may be that we will just lower the alignment slightly, by a metre or something if we had to. But based on the information available, we believe that the sort of risks that you're talking about are not actually going to manifest.

248. MR GLADWIN: Well, I will give you some anecdotal evidence. One of the

farmers was telling me that two years ago, he bored a borehole in his land, and he found a 200 foot deep hole about 30, 40 metres down? Now, what happens in that circumstance? How does your tunnelling machine deal with that?

249. MR SMART: That's why we have the type of slurry machines that we are talking about. Now, in the event – and I go back to what I mentioned about Kuala Lumpur, where you have precisely that; where you have washout and major hollows which they have to tunnel through. Now, one of the ways of dealing with that is you can fore-pole ahead of the tunnelling machine and actually fill up those voids should they be – or, it's probable that you can still cope with that with the type of machine that we're using, because it depends on the water pressure, it depends on what the ground might do. This is all part of what we will find out more with our geotechnical investigation, but the machines that we're using are designed specifically to cope with these types of hazards.

250. If we found that we did not have these hazards, we would use a machine which is called a pressure balance machine, which you use typically in the Lambeth groups that we talked about, the silty sands and clays, where there's a different way in which the face support comes on. But we've used the machine which is a slightly more expensive machine; it's a machine that is designed precisely for these conditions.

251. MR GLADWIN: Thank you, I think basically it's very clear that at the moment, it's – we haven't got a finalised design? It's become very clear that the investigations haven't been done and that design is still to be finalised. You know, that's what you said, whether you like it or not.

252. MR SMART: Well, of course, because we haven't done the detailed geotechnical and geological investigation which we are now doing, which will firm up and finalise that design –

253. MR GLADWIN: Well, exactly.

254. MR SMART: The number of times that actually that changes massively, the alignment of a tunnel, is very rare indeed.

255. CHAIR: Thank you Mr Gladwin –

256. MR GLADWIN: Can I ask another question if I may, please Chairman?

257. CHAIR: Okay.

258. MR GLADWIN: We talked about safety and safety in the two bore tunnel system. Has the full safety assessment been done on the proposed route yet, because I haven't been able to find that out?

259. MR SMART: The answer to that is, that comes at a later stage, but it starts now. So there's risk assessments done in terms of safety and design – safety starts with the design, so there's safety assessments are being done now; but of course, the full safety assessment can't be done until we get through to the operational procedures, and understand some of the other information that will come out of the detailed design. But in terms of safety, one of the ways in which you can look at safety, apart from using the common safety method of risk assessment is to look at a cross-acceptance criteria, which is where you take a railway, which has achieved its safety approval and if you're doing the same thing, you can use that an example of how you will demonstrate safety, which has to be demonstrated to a notified, independent body, I should add. It's not just the TSI; we talk about the TSI here, when we talk about some of these intervention gaps, etc. That is the highest level of safety; there's a lot more to getting the full safety case than complying with the TSI. So all of that comes as we go forward. But as far as where we are at the moment, it has been safety assessed based on cross-acceptance on High Speed 1, which operates the system that we are intending to design on High Speed 2.

260. MR GLADWIN: Is there any high speed line that's running 18 trains an hour?

261. MR SMART: I'd have to check on that; I would have to check whether there are some in Japan; as I say, it would depend on the timetabling, but most railways are designed for a capacity of 18 and above. As I say, High Speed 1 is designed for 20 train paths an hour.

262. MR GLADWIN: Just one final thing: the Bakerloo line is actually, runs a train every two minutes, so that's 30 trains an hour, but that does have the advantage of having – it only runs at about 25 mph and has a station every mile. The more transits you put in, the more likely you can run at slower speeds. If you're running at 400km/h, and 18 trains, the stopping distance is going to be very, very severe isn't it? Let me ask you a personal question: if you were on a train, it derailed in the tunnel, this tunnel

you're proposing to build, and you had to get out, and you had to walk into the other tunnel bore, would you be feeling very happy with that, knowing that the trains could be coming through at - well, starting at 320km/h. And okay, they turn the power off and they slow down, but they take three or four kilometres at least, don't they, to stop. Would you be happy to do that?

263. MR SMART: Of course. One is never happy about having to go into an emergency incident and cope with something where there's a fire. I wouldn't be happy about getting out of my house if it was on fire, but I would certainly do it. The reason that we have this is because we can ensure that passengers can safely get out the train. I mean, I don't think happy is the question. It's, can we be as absolutely sure as we can that we can get people out of that tunnel in the event of an unsafe incident? No question about it, and that's what we're designing it to do.

264. MR GLADWIN: Just the final one then, with people leaving the tunnel, they can't leave through vent shafts can they?

265. MR SMART: You could technically do that, although that is not the way to do it, because you have got lifts and you have got stairs. It is possible to do that, but that is not the way that the emergency planner, the operational procedures would be written, no.

266. MR GLADWIN: You would have a problem wouldn't you, with having sufficient safe area to store the maximum number of passengers on a train, which is what I understand the safe areas have to be designed to do?

267. MR SMART: Yes, there is a factor there. We could create that at the shafts, but that would take up more space, etc. But, we do have to have a hard standing anyway there, because that is where emergency services come in and they need a certain amount of area anyway. But that is not the way, as I've said, we would evacuate our tunnels.

268. MR GLADWIN: Thank you.

269. CHAIR: Thank you, Mr Strachan, anymore questions?

270. MR STRACHAN QC (DfT): No, just for the record, I think the tunnel alignment below the River Misbourne is 20 metres below. So it's currently shown at a slightly

lower depth than the discussions –

271. DR BAILEY: 20 metres.

272. MR STRACHAN QC (DfT): Sir, I've got Mr Miller here to deal with any of the other issues in relation to the wider effects. I'm conscious that you're going to cover quite a lot of that tomorrow, but on the other hand, for example, in relation to public rights of way, a number of facts were stated, which we don't agree with in terms of the effects on the public rights of way, so I was proposing to get Mr Miller just to clarify that.

273. CHAIR: Let's sweep it up tomorrow because I'm sure Bucks is going to raise the issue as well.

274. MR STRACHAN QC (DfT): Okay.

275. CHAIR: Brief final comments, Mr Gladwin; you moved through your presentation earlier, I think pretty well. Thank you.

276. MR GLADWIN: Well, I will just give a very short winding up. We've heard today a number of arguments with regards to costs. Naturally, HS2 Limited are interested in minimising the construction costs and are reluctant to consider the benefits quantified for avoiding or minimising the damage to the AONB. However, we submit that it is not HS2 alone who should be involved in making this decision. Rather, it should be in conjunction with the Department for Transport, which has overall responsibility for the project. We believe that our case for a three bore tunnel is a matter of balancing the extra construction costs against the value of conserving the AONB, and the environmental and other benefits, including passenger safety.

277. Whilst this cost is quite considerable, it represents only a tiny percentage of the overall construction cost, as well as enabling the government to meet its commitments to conserve and enhance the AONB. If the business case for HS2 is robust, and if it is to be the engine for growth, that the government confidently predict it will be, then these extra costs would soon be recouped. Thank you.

278. CHAIR: Thank you very much. Right, we now move on to Wendover, and I call petition 106, 1512, 605 and 83, which is Halton Parish Council, Wendover Parish

Council, Wendover Society and Wendover – I presume that's Stop HS2?

279. FROM THE PUBLIC GALLERY: I understand they're due at two o'clock.

280. CHAIR: Everybody was listed from 09.30.

281. FROM THE PUBLIC GALLERY: I am only a petitioner of interest; I'm not part of the Wendover Parish Council.

282. CHAIR: Okay, I'll adjourn for 20 minutes, can we try and find out where they are? Order, order.

Sitting suspended
On resuming—

283. CHAIR: Welcome back to the HS2 Committee. We have called 106, 1512, 605 and 83, Halton Parish Council, Wendover Parish Council, Wendover Society and Wendover Stop HS2 to come and present their case to us. We called them at 11.30, which means there was an hour and a half this morning that we could've used to hear their case. I don't intend throwing them out for not turning up, but I do intend to adjourn the committee until two o'clock, and we'll suggest strongly that they stick to one hour, and make their salient points before the committee, because they've wasted one and a half hours sitting time of this committee, where there barristers, engineers and Members of Parliament. So they will come on at 2.00; they will have an hour and that will be it. Order, order.