authors on this subject, and it varies on a continuum from almost nothing, which I suspect most protected landscapes probably are, because they have no value, to a large number for productive land and so forth. Taking a number between those is a hazardous business; it's been done and you will hear more evidence on that later on. The position that has been taken, as I say as I understand it, is on the round somewhere on this continuum between nothing and whatever number it is value at. It is an arrangement that reflects to society at large what this value is.

285. Just to repeat my observations about Mr Gould's comments, what he has described is precisely what happens for many schemes, road schemes, certainly many railway schemes and so forth. Our argument here is that, in these particular and unusual circumstances, a different set of rules should be commended to the Select Committee.

286. MR STRAKER QC: Thank you very much. Thank you, Mr Payne. Thank you, sir. Sir, what I would like to do now, as forecast, is call Mr Blaine, who the Committee has heard from before and who the Committee will remember is an engineer with a variety of qualifications.

287. CHAIR: I note there are nearly 80 slides or 79 slides. Can we go through them relatively quickly, because I'm beginning to feel we're a bit over-slided and there are some which are otiose. We don't need to go through them.

288. MR STRAKER QC: Sir, we were very conscious of that in drawing this matter up. Obviously there's a stepped approach, which I'm conscious of, and we'll try to take those steps, sometimes leaps, at a time. I'm also very conscious of that when we come later on to some of the landscape slides. There's quite a considerable picture story to be told, which once again, in my mind's eye, I'm envisaging taking those steps quite quickly. That they are steps and they lead to a definite conclusion I'm sure the Committee will have in mind.

289. Mr Blaine, we've got your slides, which begin at A1179(2), where you introduce yourself and set out in short form your qualifications.

290. MR BLAINE: That's correct, yes.

291. MR STRAKER QC: On the following slide, you set out who it is you represent,

which we can pass through. We then get to the fourth slide, where you ask and answer the question.

292. MR BLAINE: Yes, that's right. We have been instructed to investigate tunnel solutions and we've undertaken a full study to look at various options.

293. MR STRAKER QC: Then number 5, still in answer to that question, confirmatory statements by HS2 Ltd are recorded, running back to Arup studies in 2012 and as recently as the review of long tunnels in June 2015. Is there anything to add in the middle, other than what we can see there?

294. MR BLAINE: No, just the extract from the statement, which confirms that it is a feasible solution.

295. MR STRAKER QC: Then you set out, number 6, how you've come to review routes through the valley. You've used design standards from HS2 and come, number 7, to select two preferred routes and agreed a preferred route with the CDC and other authorities.

296. MR BLAINE: That's correct, yes.

297. MR STRAKER QC: Then we get to number 8. You've developed the design and reported green route.

298. MR BLAINE: Yes, that's not a route that is in front of you. That was a previous scheme design, so you don't need to worry about it. That's not yet another option.

299. MR STRAKER QC: Then you record in the same one and revise that design, was it, to suit the new safety standard of Chilterns Long Tunnel?

300. MR BLAINE: That's right. The introduction of the new safety standards for safety in long tunnels allowed us to consider the option for the underground fire-fighting point in particular.

301. MR STRAKER QC: Very well. Number 9, you record the support the local authorities, the parish councils, the civic societies and charities, and the residents groups.

302. MR BLAINE: That's correct; they all support this solution.

303. MR STRAKER QC: Then we come to number 10. Here we touch a bit slower if you don't mind: 'complies with latest TSI', that's a standard drawn from where?

304. MR BLAINE: European standard technical standard specification of interoperability of safety in railway tunnels. There are a number of TSIs, but this was particularly about the tunnels.

305. MR STRAKER QC: That requires that which is spelt out on the slide.

306. MR BLAINE: Yes, the particular point about this is the safety intervention at up to 20-kilometre intervals. It provides for the safe delivery of a train in trouble, generally considered to be fire, where passengers can be evacuated and the fire could be dealt with.

307. MR STRAKER QC: It allows for an underground fire-fighting point. That's in contrast if you don't have the intervention gap.

308. MR BLAINE: Yes, that's right.

309. MR STRAKER QC: You refer to there having to be a safety risk assessment, in any event.

310. MR BLAINE: The tunnels will all have a safety risk assessment, and the question of whether a gap or a fire-fighting point is necessary would depend on the safety considerations of the emergency services and the train operators, as well as the operators of the railway system, so the undertaker as well as the operators would consider whether the safety needed some sort of intervention of this nature, at 20 kilometres in particular, with the tunnel that we're proposing of 24 kilometres. Yes, it's longer, but it's not necessarily that much longer, unlike the Channel Tunnel, which is obviously much longer than 20 kilometres.

311. MR STRAKER QC: Number 11, please.

312. MR BLAINE: The Chilterns Long Tunnel includes an underground fire-fighting point, which is positioned at Little Missenden vent shaft. That's midway at almost the centre of the Long Tunnel, but it could have an intervention gap, as Mr Payne has

outlined, an open-to-air intervention gap. That would be in the vicinity of Wendover Dean or Durham Farm or, with the safety risk assessment, the potential – and it's only potential, I'm not saying it absolutely – that with careful consideration it could be avoided altogether, and the cost of that could be avoided.

313. MR STRAKER QC: Thank you, then number 12, please.

314. MR BLAINE: The Chilterns Long Tunnel alignment was particularly also needed to consider the Stoke Mandeville maintenance loop, which has not been mentioned much previously, but it's the maintenance loop just to the north of the AONB, alongside Stoke Mandeville. This is required by HS2 for maintenance purposes to bring maintenance trains down from Calvert to a point at which they can then access the London end of the line during the closed period, but also for the safe storage of a broken-down train and evacuating passengers to a rescue train, which could be then taken on. The maintenance loop has two purposes in that way. We've taken account of that.

315. We consider the operational need might reduce, but that's to do with the length and so on. That's more of a detail. The crossover is a requirement at the head of the tunnel to allow for trains in either portal to cross over to another line, so they can be taken into a loop. We've allowed for that. There's been a bit of dispute about the alignment; we have a slight curvature of the alignment coming in to the maintenance loop for the Chilterns Long Tunnel, but I'll explain more about why that is. We feel that that meets railway standards and is a fairly common occurrence across the country.

316. MR STRAKER QC: Thank you, and then number 13, please. You can touch upon the route description.

317. MR BLAINE: The route was considered on the basis of the railway design and also the geology. The geology of Misbourne Valley is an important part of making the tunnel a viable solution, and plan follows the Government route and –

318. MR STRAKER QC: And then we go to 14, please.

319. MR BLAINE: There's a slight deviation westwards to cross under the A413. The north portal is positioned in more steeply sloping ground than the currently proposed

Wendover green tunnel portal or indeed the CRAG T3i portal would be. The topography is such that our portal is neatly within sloping ground, so you get a rapid increase in cover to the ball and it's a better geological interface as well.

320. MR STRAKER QC: Is this the happy chance that Mr Payne was talking about?

321. MR BLAINE: Yes, it is.

322. MR STRAKER QC: Then we get to 15, please. The route description continues.

323. MR BLAINE: There we are proposing three additional head shafts. Again, there has been discussion about whether a fourth one would be required. We accept that maybe it might be and we've allowed for the underground fire-fighting point at the Little Missenden vent shaft.

324. MR STRAKER QC: Then we get to comparisons, don't we? It's number 16.

325. MR BLAINE: Yes, sir. What I'm doing in these subsequent slides is do comparisons in plan and then later in section to show the differences. You've seen a bit of this from Mr Payne.

326. MR STRAKER QC: Okay, well let's go to number 17 then, please. We see this in plan form, I think, don't we?

327. MR BLAINE: Yes. You can see the deviation from the Government's proposed scheme, in terms of the horizontal alignment there for the Chilterns Long Tunnel, and I've boxed out what I call the northern section, which is the bit that we are dealing with in terms of comparisons.

328. MR STRAKER QC: Then we go on to the text, which talks about what you've just been showing in diagrammatic form.

329. MR BLAINE: That's right. Just as a reminder, it follows exactly the same line as the Government's proposed tunnel, from the M25 to Little Missenden, and then over the next 11 kilometres continues in tunnel. It deviates from the Government's proposed scheme, but less than 500 metres away from that alignment in the northern section.

330. MR STRAKER QC: Route comparison continues, number 19.

331. MR BLAINE: Then we look at the vertical alignment and again you've seen –

332. MR STRAKER QC: This is number 20.

333. MR BLAINE: The alignment in number 20 and, again, highlighted the northern portion, which I'll zoom in on in the following slides to show more detail.

334. MR STRAKER QC: If we stick with 20 for a moment, 20 shows the level at which the Government's scheme runs, rising up, up, up, up, up, still in tunnel and then emerging.

335. MR BLAINE: Emerging in the north portal on a gradient of about 3% upwards.

336. MR STRAKER QC: Upwards at the top of a hill it emerges.

337. SIR PETER BOTTOMLEY: Does it matter?

338. MR BLAINE: It doesn't matter, but it's just unusual. It's part of the energy requirements of getting across the Chiltern Hills. It's trying to seek the surface at an earlier position than you would really ideally want, because you end up with a steep gradient coming up from underneath the Misbourne and rising up to get to the surface, whereas our alignment doesn't do that.

339. MR STRAKER QC: Then we go, please, to 21.

340. MR BLAINE: 21 shows –

341. SIR PETER BOTTOMLEY: What sort of gradient is that?

342. MR BLAINE: 3% is 1 in 30.

343. SIR PETER BOTTOMLEY: What's the conventional maximum you would expect?

344. MR BLAINE: General research has shown that 3% is actually one of the steepest gradients on a railway in Britain, and so more like 2% you'd ideally go to the maximum on. 3% is quite a steep gradient.

345. MR CLIFTON-BROWN: What impact would that have on the speed of the train?

346. MR BLAINE: We'll go on to more detail of that just now.

347. MR STRAKER QC: Pausing there, I think it has an impact both on speed and also on energy used, because it's rising up the hill.

348. SIR PETER BOTTOMLEY: It works both ways, so you use less going down.

349. MR STRAKER QC: Yes, I grant you that. Anyway, the contrast between the Government's proposed scheme and the Chilterns Long Tunnel, relative to the flat of the Chilterns Long Tunnel and the climb of the Government scheme, and then route comparison continues. You were just touching upon 21.

350. MR BLAINE: Again, I've gone in more closely on the northern sections, so that you can see the gradient and the topographic differences.

351. MR STRAKER QC: We get there in 22.

352. MR BLAINE: In 22, this illustrates the topography. The black dotted line is the ground surface, which is slightly different because we're on a different alignment, but you can see, on the right-hand side, is the arrow, which unfortunately is not labelled, but that's Little Missenden vent shaft to the right.

353. MR STRAKER QC: It's there.

354. MR BLAINE: Yes, and then you've got the north portal for the Government's proposed scheme, partway up the 3% slope, then through the green tunnel, still climbing to the summit at South Heath, and then dropping down across the viaduct and through the green tunnel at Wendover and on to the Vale of Aylesbury and the Stoke Mandeville maintenance loop.

355. MR STRAKER QC: The contrast being –

356. MR BLAINE: The contrast is the Chilterns Long Tunnel is a much flatter gradient and, therefore, less energy and that's been calculated by HS2 in their report on the Chilterns Long Tunnel to be equivalent to about 190 kilowatt hours per return journey, so taking account of the fact that some trains are going downhill and others are going up. Per return journey, that's 190 kilowatt hours, which doesn't sound a lot. That's every journey. Now, if we take the number of trains per hour that is proposed,

going up to 18 trains an hour, that multiplies out to about 3,600 kilowatt hours per hour. If you take a day's amount of energy consumption that comes to 72,000 kilowatt hours per hour of energy saved, as a result of the Chiltern Long Tunnel. A rough calculation indicates that that's the equivalent of the electricity consumption of 6,000 houses, per day.

357. MR STRAKER QC: Saved by the Chilterns Long Tunnel?

358. MR BLAINE: Saved by the Chilterns Long Tunnel.

359. MR CLIFTON-BROWN: Can I ask if that takes into account the regenerative effects of the trains going downhill as well, because then they feed into the grid instead of just pulling from the grid?

360. MR BLAINE: Yes, this is the net. According to HS2's calculations, this is the net energy saved as a result of the Chilterns Long Tunnel.

361. MR CLIFTON-BROWN: It's that minus the regenerative.

362. MR BLAINE: Yes.

363. MR STRAKER QC: 6,000 homes, did you say, a day?

364. MR BLAINE: Per day.

365. MR STRAKER QC: That's 22 then, and then we go to 23, please.

366. MR BLAINE: In 23, we're looking at the effect of the proposed scheme on the AONB. Again, you see these slides from Ray Payne, if we can just go through them just to remind you of the fact that we've got nearly 9,000 metres of AONB affected by the Government's proposed scheme.

367. MR STRAKER QC: Is that square metres?

368. MR BLAINE: No, that's metres. And 405 metres of the AONB affected by the Chilterns Long Tunnel. That's really to do with the portal position at the northern end.

369. MR STRAKER QC: Then we get to 24, a plan similar to that which we've seen before.

370. MR BLAINE: That's right. That's just again highlighting the northern section, which is the section that we're particularly concerned about. That's the difference in distance affecting the Government's proposed scheme. Following that –

371. MR STRAKER QC: 25.

372. MR BLAINE: 25 is the same for the Chilterns Long Tunnel.

373. MR STRAKER QC: Then continuing in the route comparison, your next slide 26 shows the location of the underground fire-fighting point, if there is one or a need for one.

374. MR BLAINE: This is just to identify where we were proposing this underground fire-fighting point, which is the midway point of the Chilterns Long Tunnel.

375. MR STRAKER QC: We get to 27 for that, I think.

376. MR BLAINE: That's just to zoom in on those plans to show its position alongside the A413, just north of Amersham.

377. MR STRAKER QC: Then we go, please, to 28, the difference in horizontal alignment between Great Missenden and Wendover.

378. MR BLAINE: Just again going in closely to the northern end to show how the alignment varies between the Government's proposed scheme and the Chilterns Long Tunnel –

379. MR STRAKER QC: We see that in picture form at 29, do we?

380. MR BLAINE: That's right. The Chilterns Long Tunnel passes underneath Bacombe Hill. This possibly answers your question, sir, about how much farther west the Government's proposed scheme could be aligned, because of the rising ground coming up from Wendover up to Bacombe Hill. It would be quite difficult to avoid another ball tunnel, if you push the alignment west, which is why we're able to achieve it. We're in deeper ground and the next sections on geology will show that.

381. MR STRAKER QC: We get to 30 then.

382. MR BLAINE: We're then looking more closely at the comparison between the

Government's proposed scheme and the Chilterns Long Tunnel, and there we're showing the position of the tunnel in relation to the AONB boundary.

383. MR STRAKER QC: We get to 31 to see that in plan form, do we?

384. MR BLAINE: That's right. You can see the radius of curvature of our alignment compared to the Government's alignment, as it approaches the Stoke Mandeville maintenance loop, which is in the section just to the north.

385. MR STRAKER QC: The north portal for the Long Tunnel is there.

386. MR BLAINE: That's right.

387. MR STRAKER QC: The comparative distance to Wendover, which we saw earlier on, we have in mind.

388. MR BLAINE: Yes.

389. MR STRAKER QC: Then 32, please.

390. MR BLAINE: We're now going into some of the construction arrangements for this scheme. We will be proposing four tunnel boring machines, two in each direction, one pair coming from the south, as proposed in the Government scheme, and one pair coming from the north from the north portal position, near Wendover. They'd meet at the Little Missenden vent shaft and be withdrawn at that point. It's a fairly common practice to withdraw TBMs through the vent shafts. The balance of the drive would mean that, actually, the programme for tunnelling would be seven weeks shorter than is currently proposed for the proposed scheme.

391. MR STRAKER QC: Is that seven weeks shorter for the tunnel as extended?

392. MR BLAINE: Yes, it's shorter because the drive is balanced and therefore you're driving tunnels of a similar length in both directions, whereas the Government's proposed scheme has another kilometre or so of drive from one direction.

393. MR STRAKER QC: Then we deal with the construction of the tunnel, 33, please.

394. MR BLAINE: The effects of the construction are less than 50 hectares of the AONB affected. The construction sites are concentrated at discrete locations of vent

shafts and particularly at the north portal.

395. MR STRAKER QC: And 34?

396. MR BLAINE: The south portal drive site would be as proposed by HS2. The drive would be 1.1 kilometres shorter, so the length that gives you that seven-week saving, and the quantity of arisings at the south portal would be reduced by about 10%, because that 1 kilometre of tunnel drive is being taken to the north portal.

397. MR STRAKER QC: 35?

398. MR BLAINE: The north portal drive site would require additional land outside of the AONB. It avoids significant areas of land within the AONB.

399. MR STRAKER QC: 36?

400. MR BLAINE: The portal is positioned very much suited to the topography and the geology, and the topography allows for screening by the local landscape mounding and it's positioned in very stable geological strata, so it will actually be a very good position to have the north portal.

401. MR STRAKER QC: And then 37?

402. MR BLAINE: What I'm looking at here is the Government's proposed scheme and the Wendover green tunnel in particular and how it interacts with the groundwater and unstable ground of Bacombe Hill and the fissure flows, etc. If we look at the next slide –

403. MR STRAKER QC: 38.

404. MR BLAINE: You'll see the picture. This is the geological section along the line of the Government's proposed scheme, and the Wendover green tunnel can be seen as that double red line, with the portal at the right-hand end. The portal, you've got dashed lines, which indicate unstable weathered chalk. You have weathered valley floor with difficult ground conditions to give you structural foundations for the green tunnel. We're not disputing that something can be done; we're just flagging up that there's potential for unexpected geological issues that have to be dealt with and may not be allowed for in programme or cost.

405. MR STRAKER QC: Is that avoided in the Chilterns Long Tunnel?

406. MR BLAINE: Yes, it is. If we go to the following slide –

407. MR STRAKER QC: 39.

408. MR BLAINE: The groundwater level again is shown in blue. The tunnel is bored through the zone of instability, rather than cutting through it, and it's sitting on the Upper Greensand and Gault Clay.

409. MR STRAKER QC: That's shown in 40.

410. MR BLAINE: You can see that in that section again through the proposed Chilterns Tunnel, which is the pink line. The blue line is the groundwater, so it's in the groundwater, which comes out in the strata above the portal. The landform is particularly of interest, if you look at the shape of that landform. That's fairly typical of unstable ground, which is considered to be in a metastable condition. It's reached a natural stability, but disturbance of it could cause it to move.

411. MR STRAKER QC: 41, please. You record how the next slide, which we're going to look at in a moment, shows a cross-section through this important feature in the AONB, this important feature being?

412. MR BLAINE: Bacombe Hill.

413. MR STRAKER QC: Beckham Hill?

414. MR BLAINE: Bacombe.

415. MR STRAKER QC: Bacombe Hill, I beg your pardon.

416. MR BLAINE: Beckham Hill is yet to be known. We have had Henman Hill and so on, but we haven't had Beckham Hill yet. Here the Chiltern Tunnel, if you look at the section.

417. MR STRAKER QC: Which we go over to do that, 42.

418. MR BLAINE: You can see that the Chilterns Long Tunnel passes well below the ground surface and in the zigzag chalk, which is a much more stable material. The

Government's proposed scheme is on the edge of all that and on the edge of Bacombe Hill. That slope is also an indication of the potential instability. We're only saying 'potential'; it could only be proven by more geological investigations, but the hydro-geology across here has also been a concern. There are some reports about the hydro-geology and HS2 has done some further work in looking at that. They clearly do have a concern about dealing with the hydro-geology, with the groundwater coming out into the springs within Wendover. I don't want to get into the detail of that – that could be left for later petitioners – but I just want to point out that the tunnels would be not affecting that groundwater risk at all.

419. MR STRAKER QC: Thank you. 43, please. We then come to the construction of the CLT, the Long Tunnel continued, with the next few slides showing the north portal construction in relation to the AONB boundary.

420. MR BLAINE: Yes, that's right. I want to just go through the proposals for the construction area of the north portal, which is the area that's been causing the most concern for people.

421. MR STRAKER QC: We get to 45, do we, for that purpose?

422. MR BLAINE: Yes. If you look at the plan, this is the area required for construction of the Government's proposed scheme, the Bill scheme. You can see the blue area running right past Wendover and obviously on through the AONB and northwards, past Stoke Mandeville. The green line indicates the AONB boundary.

423. MR STRAKER QC: The red line is obviously HS2.

424. MR BLAINE: The red line is HS2.

425. MR STRAKER QC: Then we go, do we, from there to 46?

426. MR BLAINE: The next one is to introduce the area for the north portal construction for the tunnel boring site.

427. MR STRAKER QC: Which we get to at 47.

428. MR BLAINE: That's right. The additional area needed outside the AONB is indicated in pink and there's a bit inside the AONB actually.

429. MR STRAKER QC: Which is just there. Is that right?

430. MR BLAINE: That's right, yes, just around the corner.

431. MR STRAKER QC: This is the additional area outside the AONB.

432. MR BLAINE: Yes, that's right. The important thing to note is the area that is not needed within the AONB, alongside Wendover.

433. MR STRAKER QC: To see that, we have to go back to 45, where we see what is marked in blue as the area which has been taken out as no longer required.

434. MR BLAINE: That's right, yes.

435. MR STRAKER QC: Which is proximate to Wendover and its residential community?

436. MR BLAINE: That is right.

437. MR STRAKER QC: Do we then go to 48?

438. MR BLAINE: In 48 we are looking at the north portal in more detail. We are going to look at an indicative plan of the portal and a section across it.

439. MR STRAKER QC: We get that at 49, or does that simply show what is going to come?

440. MR BLAINE: That just shows you what is going to come and the locality of it in more detail.

441. MR STRAKER QC: We immediately go to what is to come at 50.

442. MR BLAINE: That shows our arrangement for the north portal site. In particular, we are indicating, for example, the diversion of the road around the top of the portal and the portal structure, which would be a reinforced concrete box structure in a cutting. That would be backfilled and you would end up with something a bit like a green tunnel, but it would be part of a portal with acoustic treatment as well as a portal hood. This is indicative. We have no more detail about portal hoods than has been indicated so far by HS2, and this is a development of their scheme which was outlined in the tunnel

presentation some months ago – I cannot quite remember the date – by Mr Smart.

443. MR STRAKER QC: Then we get to 51, which is similarly indicative.

444. MR BLAINE: This is the indicative section of the portal structure. This is outside the tunnel bore. The lines would be brought through from the bored tunnel into this portal with perforations inside the surface to allow for acoustic pressure waves to be alleviated; and it could also form part of the headhouse area which is indicated on the plan.

445. MR STRAKER QC: Do we go to 52 where the text indicates what the north portal compound for the construction of the Chilterns long tunnel contains?

446. MR BLAINE: Yes. We have indicated that about 50 hectares of land would be needed for the construction compound, 20 hectares of which is in the AONB. We look at it in a bit more detail in the next slide.

447. MR STRAKER QC: 53, please.

448. MR BLAINE: Possibly as much as 65 hectares would be available, but that would still mean it was not too close to Stoke Mandeville as a settlement, and it overlaps with the construction area for the Government's proposed scheme.

449. MR STRAKER QC: Let's move from that to the question of what comes out of the tunnel when you dig it. It may be thought that there is a lot of material to be got out of the tunnel in digging it and that can be contrasted with what is dug out when one is at surface level. Go to 54, please.

450. MR BLAINE: That is right. This is just a diagrammatic illustration of the difference between boring the tunnel and surface excavation. It is purely to give you an idea of the difference. Obviously, there is minimal cutting involved in the tunnel bores, but at the surface there is much greater excavation because the alignment has more cutting in it than filling. For most schemes you will try to balance it, but for environmental reasons the surface route is set lower and, therefore, additional material is to be removed.

451. MR STRAKER QC: In 55 I think you have the figure for what is to be moved on

the Government's proposed scheme.

452. MR BLAINE: The original calculations published in the environmental statement indicated that 7 million cubic metres of soil had to be moved within the AONB.

453. MR STRAKER QC: Is that as in the ES?

454. MR BLAINE: Yes, but the figures produced last week, contained within the additional provision published today, indicate that this is now 4.6 million cubic metres. There is no explanation as to how that has been achieved, but we may find out.

455. MR CLIFTON-BROWN: Could you go back one slide?

456. MR STRAKER QC: Go back to 54.

457. MR CLIFTON-BROWN: Is the surface excavation just for going through areas of outstanding natural beauty? Generally speaking, railways do not excavate in that way.

458. MR BLAINE: They don't. This is more to do with trying to deal with the topography of this section, because we are going over the Chiltern hills. Although you think you are in a valley, the line is up on the side of the valley. Not only are you dealing with the valley itself but the intervening cuts into it. This cutting is to balance the alignment.

459. MR CLIFTON-BROWN: It is a tunnel in effect; you are actually going underground?

460. MR BLAINE: We are not going underground; it is in a deep cutting, and then across viaducts and some embankments as well. Some of this cutting is taken as embankment fill, but it is to deal with the topography of the land.

461. MR STRAKER QC: In consequence of that deep cutting, you are taking a lot of material out, whereas in the tunnel you are just going through in a bore?

462. MR BLAINE: That is right.

463. MR STRAKER QC: We were looking at the numbers. The numbers have changed with the additional provision. Go back to 55.

464. MR BLAINE: The original numbers indicated that 7 million cubic metres of soil had to be moved within this section of the AONB. That has now dropped to 4.6 million cubic metres, so it is a 30% reduction, but there is no explanation as to how that has occurred. Maybe we will hear more detail on that from HS2.

465. MR STRAKER QC: Does it all go by road or along the trace as recorded on your slide 55?

466. MR BLAINE: It goes either by road or along the trace, the trace being the line of the route itself as it is constructed.

467. MR STRAKER QC: We get to 56.

468. MR BLAINE: In 56, again there is an indication of 6 million cubic metres of material to go into embankments and landscaping mounds, which would have been a substantial change to the topography and profile of the AONB. Under the additional provision, that now seems to have reduced to 3.7 million cubic metres.

469. MR STRAKER QC: Pausing there, is there any explanation as to how that reduction has been effected?

470. MR BLAINE: Not in the information I have seen so far. In addition to that 6 million being distributed into the AONB, 1 million cubic metres were to be dumped at Hunts Green Farm as the sustainable placement area. Again, under the additional provision that is being used temporarily rather than as a permanent dump of material. The proposal is that 860,000 cubic metres will be going off site, but the dump at Hunts Green Farm, which I think will be dealt with separately, would have been a loss of agricultural land, and could still be a loss of agricultural land, for about 10 years depending on how it is managed, and, if it was left there, would be a permanent change to the local character of the land.

471. MR STRAKER QC: It being temporary, does that have any significance for the number of lorry movements?

472. MR BLAINE: Yes, it does. There is an increase in lorry movements as a result of the additional provision to make it temporary.

473. MR STRAKER QC: We get to 57 where we now begin to look at the Chiltern long tunnel by way of contrast with the arisings there. We have only just spoken about the arisings in consequence of the Government's scheme.

474. MR BLAINE: Yes. For the Chiltern long tunnel all the arisings would come to the north portal. Obviously, the south portal is still receiving arisings as well, but that is managed locally. As to the north portal arisings, excuse the mixture of units here, but, if you stick to the 2 million cubic metres, which is an agreed figure with HS2, that would be predominantly a chalk slurry coming from the tunnel boring machines. It is a source of concern to local residents, but we believe it can be disposed of productively.

475. MR STRAKER QC: You give some significance as to that in 58, do you?

476. MR BLAINE: For the Government's proposed scheme, the good material is likely to be exported for use elsewhere. A lot of the dry gravels and chalk in the surface work would be useful engineering material, but the poor material, which could come from any part of the works, could be imported into the Chilterns. That is still to be discussed in detail. The Chiltern long tunnel arisings could be disposed of by rail, because that is a well recognised method of disposing of tunnel arisings.

477. MR STRAKER QC: For that, you need 59, do you?

478. MR BLAINE: Yes. If it is disposed of by rail, dewatering of the material would be required so it could be handled in rail wagons. It would need a railhead, which could also be used to bring in materials, but it could be taken to a wide range of destinations, and there is capacity to do so. We have had confirmation from one very substantial rail freight operator in the UK that they would be able to handle this material.

479. MR STRAKER QC: I think we see that on the following slide, 60, from D B Schenker.

480. MR BLAINE: They have looked at the capacity of the Chiltern line to accommodate freight traffic. Their estimate is that under current arrangements they could probably get three to four trains in any 24-hour period from the railhead at this location.

481. MR STRAKER QC: When they talk about three to four trains, what sort of length

would that be?

482. MR BLAINE: These are about 700 metres long. To give you an idea of whether or not that is adequate, HS2's report on the Chiltern long tunnel indicated that it would probably require 20 paths per week which is about two to three train paths a day, so that would fit in with this capacity.

483. MR STRAKER QC: 61, please.

484. MR BLAINE: Another option to dispose of material would be by pipeline. Chalk is pumped currently from a quarry at the northern edge of the Chilterns at Kensworth all the way to Rugby cement works, which is about 60 kilometres away. That has been operating for many decades. That is a very common method of transporting material. Obviously, it takes lorries off the road, but the pipeline would be taken to a point where it could be used for cement making or quarry restoration, if there is a suitable quarry nearby that needed filling.

485. MR STRAKER QC: We have now identified two main means of disposing of the arisings from the Chilterns long tunnel: rail and pipeline. You get to the third at 62.

486. MR BLAINE: The third one is by road, which is the least desirable. Again, dewatering would be required. That will be about 300 lorries per day in two directions, so about 600 trips a day.

487. MR STRAKER QC: That would be if one was not moving it by pipeline or train?

488. MR BLAINE: That is right.

489. MR STRAKER QC: Then you get to 63 where you ask whether a tunnel would protect the environment, so here we are making a contrast, are we?

490. MR BLAINE: Yes. The Government's proposed scheme had 12 million tonnes, now 8 million tonnes, of soil to be moved from the AONB. The explanation for that difference is still to come.

491. MR STRAKER QC: That contrasts with how much for us?

492. MR BLAINE: That is 3 million tonnes for the tunnel and 370 hectares of AONB

is disturbed in the works – you have seen the extent of the construction works – including 100 hectares alongside Wendover.

493. MR STRAKER QC: That is for the Government proposed HS2 scheme?

494. MR BLAINE: Yes. In addition, 10 hectares of ancient woodland would be lost.

495. MR STRAKER QC: That is 64.

496. MR BLAINE: That would include one scheduled ancient monument, and permanent operational noise within the AONB.

497. MR STRAKER QC: Then we come to the question in 65: does the tunnel protect the environment?

498. MR BLAINE: Clearly, there is a reduction in the volume of arisings. 3.2 million tonnes would be coming out of the north portal, and about 50 hectares of AONB would be disturbed, with 20 hectares at the northern end and elsewhere.

499. MR STRAKER QC: You have also recorded the loss of woodland for the Chilterns long tunnel and the scheduled ancient monument in 66.

500. MR BLAINE: Yes. There is no loss of ancient woodland and scheduled monuments and no operational noise.

501. MR STRAKER QC: 67 is in tabular form.

502. MR BLAINE: This gives an idea of the effects of the earthworks effects of moving 12 million tonnes, which is now down to 8.3 million tonnes. The Chilterns long tunnel is 3.2 million tonnes. With that reduced quantity, it is still a 61% reduction in earth moving. The area of surface works in the AONB is 370 hectares as against 50 hectares, so that is an 86% reduction. As to the loss of ancient woodland, it is 10 hectares against zero, so that is a 100% saving.

503. MR STRAKER QC: Does the following slide show in graphic form the comparison of area disturbed in the AONB?

504. MR BLAINE: This just gives you an idea of the cumulative area affected within the AONB for the section from Little Missenden to Wendover. You can see how much

of the AONB is affected. It is not the route itself; it is the disturbance of the construction by kilometre and then the total up to 370 hectares.

505. SIR PETER BOTTOMLEY: Does this include, for example, haul routes and utility works done in the road?

506. MR BLAINE: This is what is identified in their construction boundary.

507. SIR PETER BOTTOMLEY: That still leaves my question.

508. MR BLAINE: It is haul routes within the trace; it is not haul routes around public roads.

509. SIR PETER BOTTOMLEY: But it is everything within the construction boundary?

510. MR BLAINE: Yes.

511. SIR PETER BOTTOMLEY: If there is six weeks' work to move a utility, does the area around that count as being disturbed?

512. MR BLAINE: Only where it has been identified. To clarify that, this area is directly round the trace, not the peripheral areas, so those additional disturbances are not included.

513. MR STRAKER QC: So this would be a conservative statement rather than anything else?

514. MR BLAINE: Yes.

515. MR STRAKER QC: In 69 you ask the question whether the tunnel protects the AONB.

516. MR BLAINE: Yes, and I think the answer is: as much as it can, although there is still some effect.

517. MR STRAKER QC: In 70 you look at some costs.

518. MR BLAINE: This is a breakdown of the various elements of cost using HS2's

figures from May 2015. It shows the Government's proposed scheme and the build-up of their cost. This is the 11-kilometre section that is currently not tunnelled. It is not the whole tunnel cost. This is the Government's proposed scheme and how it is built up; then the Chiltern long tunnel, including the underground fire-fighting point, and the difference. You get to the number 532.

519. MR STRAKER QC: Which we have seen before?

520. MR BLAINE: Yes.

521. MR STRAKER QC: In 1179 that figure of 532 is repeated, shaving off the two and rounding it.

522. MR BLAINE: Yes.

523. MR STRAKER QC: The 'but' is then given to lead us to 72.

524. MR BLAINE: Yes. That cost, just to reinforce it, ignores the land compensation costs of the government scheme; the socioeconomic costs to the community; and the non-market effects of damage to the AONB, which has been discussed already.

525. MR STRAKER QC: We see at 73 the extra bit that you have put into the table in the build-up of it, which is principally the acquisition of land cost, is it?

526. MR BLAINE: That is right. If you look at just 532 for the Chiltern long tunnel and add three and subtract 50, you get to 485, just to give you a bit of mental exercise in the middle of the afternoon.

527. MR STRAKER QC: You say in 74 that those cost estimates also ignore something else.

528. MR BLAINE: We believe it ignores programme risks related to groundwater issues and the instability of ground for cuttings and foundations in the surface route. We have not gone into a lot of detail. The surface route is running across weathered chalk and potential solution features in the chalk right through the Chilterns. All of this could affect the stability of the cuttings and the foundations of the various structures, which all add to the risk of the scheme.

529. MR STRAKER QC: 75, please.

530. MR BLAINE: It also ignores the economic and non-economic effects of the scheme, which will be described later by Mr McCartney.

531. MR STRAKER QC: In 76 something else is ignored.

532. MR BLAINE: These are the major environmental impacts of the scheme which are considerable, and they will be described in much more detail by Mrs Kirkham and Mrs Murray.

533. MR STRAKER QC: That is cost. As to delay, in 77 you ask the question: will a tunnel delay delivery? We have seen already in passing that building the tunnel longer takes less time than building a shorter tunnel.

534. MR BLAINE: That is right. 77 just simplifies matters. The proposed scheme would be roughly 63 months and the Chiltern long tunnel 64 months, so there is really no difference. The difference of the seven-week saving is more to do with estimation of the fit-out of the tunnel itself, but there is no difference in the overall time taken.

535. MR STRAKER QC: 78 is your penultimate slide.

536. MR BLAINE: This just summarises whether work has been done to answer key questions. Yes, it has. We have done comprehensive studies to look at the tunnel. The tunnel route is technically feasible. The Chilterns long tunnel has fewer risks; it will not delay the programme; it will be operationally superior, because we have talked about the energy savings; and it will conserve the AONB.

537. MR STRAKER QC: I think you have had quite a few discussions with HS2, and I think you furnished to them a statement of common ground.

538. MR BLAINE: Yes, we did.

539. MR STRAKER QC: It may be we will come to that, but for the moment we can leave it there. I think that concludes it.

540. MR CLIFTON-BROWN: Have you quantified the difference in cost in ongoing maintenance between the surface solution and your tunnel solution?

541. MR BLAINE: Not in detail. It is one of the areas of common ground that is in discussion. We believe that maintenance of the tunnel is a lot less onerous. It may cost more to do it, but it is not needed as often because it is less subject to weather, plant growth and all the rest of it. Drainage issues are less significant, and there is already a maintenance requirement for part of the Chilterns long tunnel, so this is an extension of that and really should not add much to the cost in comparison with the same amount of work on the surface. We do not believe there is additional cost. HS2 have stated they believe there is an additional cost, but it has not been quantified.

542. MR STRAKER QC: Thank you very much, Mr Blaine.

543. CHAIR: Mr Mould?

544. MR MOULD QC (DfT): Going to P7416(2), Mr Blaine, you showed the Committee some slides which compared the loss of ancient woodland as between the Bill scheme and the long tunnel scheme. You said that the Bill scheme would result in 10 hectares of ancient woodland being lost and the long tunnel scheme would mean zero loss of ancient woodland.

545. MR BLAINE: Yes.

546. MR MOULD QC (DfT): I have just put on screen a slide which shows how that translates into the overall effect of the Bill scheme on the resource of ancient woodland within the AONB as a whole. You can see that those 10 hectares result in a loss of less than .1% of the overall resource.

547. MR BLAINE: I cannot dispute those figures.

548. MR MOULD QC (DfT): You mentioned that the Bill scheme would result in a loss of a scheduled ancient monument, whereas the long tunnel scheme would not. That is Grim's Ditch, is it not?

549. MR BLAINE: Yes.

550. MR MOULD QC (DfT): We can agree, can we not, that the loss in question is about 150 metres.

551. MR BLAINE: I think it is 180 on the latest figures.

552. MR MOULD QC (DfT): We will stick to 180 metres for Grim's Ditch, which is a scheduled ancient monument whose vestigial remains extend from, I think, Dorset to East Anglia, if I remember rightly.

553. MR BLAINE: I will leave that to other heritage experts to comment on.

554. MR MOULD QC (DfT): If you turn to A1179(63), you refer to the Bill scheme disturbing 370 hectares of the AONB. That is your assessment of the maximum extent of disturbance under construction, is it not?

555. MR BLAINE: Yes.

556. MR MOULD QC (DfT): The permanent effect is going to be considerably less than that.

557. MR BLAINE: I think it is about 200 hectares.

558. MR MOULD QC (DfT): At page 65 you point out that there will be a disturbance under the long tunnel scheme of some 50 hectares.

559. MR BLAINE: Yes.

560. MR MOULD QC (DfT): Which is probably closer to the mark during operation, is it not, because you say that the construction impacts on the AONB are relatively small under your scheme?

561. MR BLAINE: That is right.

562. MR MOULD QC (DfT): So it is 200 against 40-odd hectares?

563. MR BLAINE: Yes.

564. MR MOULD QC (DfT): In the context of a total area of the AONB, which is some 80,000 hectares, that gives you a sense of the relative impact here.

565. MR BLAINE: I cannot dispute those numbers.

566. MR MOULD QC (DfT): If we put up P7373, you can see a plan taken from the environmental statement which shows the existing transport routes across the area of

outstanding natural beauty. You can see that the HS2 alignment is shown in the black line. You can see, moving from south to north, the M40, which I mentioned when I was questioning Mr Payne; the A413 itself and other major roads through the AONB, including the A41, I think. There is Henley Road which takes you to Oxford in the southern part of the AONB. That gives you a sense of the figure I have just put to you. That is the 80,000 hectares. You get a sense of the construction of the HS2 route at surface from Mantels Wood, albeit in a succession of deep cuttings, green tunnels, a viaduct and embankment to the northern edge of the area, and how that plays out in terms of the relative land take compared with the area as a whole, do you not?

567. MR BLAINE: Yes.

568. MR MOULD QC (DfT): Can we turn to P7392? Coming to construction traffic, this is the western half of the Bill scheme. At this point to the east we are emerging from the tunnel at Mantels Wood and going through a succession of deep cuttings, green tunnels, viaduct and embankment up to the edge of the area just before Stoke Mandeville. You can get a sense, can you not, of the traffic effects? Essentially, traffic is moving either along the trace itself, that being the black line, or accessing compounds and construction sites associated with green tunnel construction, overbridge construction and so forth, along the A413, and then turning northwards or southwards, depending on whether it is going to or coming from the construction sites, to get to and from the strategic road network.

569. MR BLAINE: Yes.

570. MR MOULD QC (DfT): Much of that traffic will go with your scheme, although not all of it, because there are vent shafts and so forth that need to be accessed, are there not?

571. MR BLAINE: Yes.

572. MR MOULD QC (DfT): But under your scheme a lot of that traffic will simply be shunted further north, where it will have to access the tunnel drive site and segment factory site serving the construction of your northern portal just to the east of Stoke Mandeville?

573. MR BLAINE: That is right. The construction works will be concentrated at the north portal. There will be some traffic along the 413.

574. MR MOULD QC (DfT): And a great deal more in the vicinity of Stoke Mandeville than under the Bill scheme?

575. MR BLAINE: If all the material that is proposed to be moved under the Government's proposed scheme will be able to move along the trace. There is the shifting of material which is going to have Hunts Green Farm as a temporary store. Therefore, material will be moving along there and onwards. We are proposing that a railhead solution would reduce that.

576. MR MOULD QC (DfT): That is your proposal, but that depends on a number of imponderables. We need to be a bit careful about what we can assume in terms of rail access. On the train paths you have been told might theoretically be available on the Chiltern line – I note the way it is put by D B Schenker – which is three or four a day, that would be the movement of materials largely at night, would it not?

577. MR BLAINE: Yes.

578. MR MOULD QC (DfT): Which would have its own environmental effects?

579. MR BLAINE: Yes.

580. MR MOULD QC (DfT): And it might be enough if you had all those potentially available paths to get the material out, but it would not be enough to get the raw materials, for example for the construction of tunnel segments, in, would it?

581. MR BLAINE: There would be potential for materials to come in as well.

582. MR MOULD QC (DfT): Only if you could get every single one of those paths, and probably more besides.

583. MR BLAINE: The volume of material coming in is much less than the volume going out, so you might need only one train. I do not have the numbers, but you would need far fewer trains bringing material in than you would need to take material out.

584. MR MOULD QC (DfT): Another way of illustrating that there is a balance to be

struck between the construction impacts of the Bill scheme and your alternative, under the Bill scheme at West Hyde at the southern portal for the Chilterns tunnel we are not estimating a need to transport any of that material away, are we, because we are using it for earthworks construction locally?

585. MR BLAINE: Yes, you are.

586. MR MOULD QC (DfT): Whereas with your proposal to bore both from the south and north there would be a shortfall of material at the southern portal, would there not? We would not have enough to be able to do all the earthworks we need to do at West Hyde; we would have to import some from elsewhere?

587. MR BLAINE: I am not sure. I have not looked at the detail of that scheme, but the reduction of about 10% in the volume of material arriving at the south portal is going to be that significant in the mitigation earthworks in that location.

588. MR MOULD QC (DfT): If you were my witness, no doubt you would be emphasising the opportunities to try to reduce the environmental impacts of construction and so forth under the Bill scheme. What we can agree on is that each has its own inescapable impacts in terms of traffic generation and so on.

589. MR BLAINE: Yes.

590. MR MOULD QC (DfT): They may not be identical, but in each case the effects are going to be significant, are they not?

591. MR BLAINE: Yes. What we are trying to do is protect the AONB which is the main focus.

592. MR MOULD QC (DfT): You are protecting the designation, are you not?

593. MR BLAINE: Yes.

594. MR MOULD QC (DfT): I understand that. If we turn finally to the question of power and P7399(5), you emphasise the point that the gradient under the Bill scheme as it crests the route at the Mantels Wood portal and beyond would result in a requirement for power as it ascends. There would be some netting off of that as it descends, but you have said that it would have a certain effect, and you drew a comparison with the power

required to power a certain number of households. We should bear in mind, should we not, that running the railway through a more extended tunnel will have its own increased power requirements, which are set out on the screen in front of you, are they not?

595. MR BLAINE: Yes.

596. MR MOULD QC (DfT): We have not got a figure for those, but over the operational life of the project the increased requirement for ventilation fans, cooling and so forth on a railway that is in a tunnel that is essentially double the length through the Chilterns is likely to be significant, is it not?

597. MR BLAINE: That is certainly what the promoters propose and describe in the report. We do not have the technical details, so we cannot really confirm that difference, but the point of raising that issue is that the energy saving of the operation is not mentioned in the slides about the operational nature of the scheme.

598. SIR PETER BOTTOMLEY: When the promoters put forward their Chilterns tunnel were these items specifically mentioned?

599. MR MOULD QC (DfT): These matters on the screen in front of us?

600. SIR PETER BOTTOMLEY: The things we were discussing with the witness just now.

601. MR MOULD QC (DfT): They are mentioned in the reports.

602. MR BLAINE: The recent reports?

603. MR MOULD QC (DfT): Yes.

604. MR BLAINE: They were not mentioned in the earlier reports.

605. MR MOULD QC (DfT): The point I am making, on which I think we are in agreement – I have not put figures to you – is that you need to balance any savings you gain in terms of energy usage from a shallower gradient with the increased energy required to power the train as it goes through the tunnel.

606. MR BLAINE: Yes. Technically, one of the things that I am not sure about, because we have not seen the detailed numbers at all, is that the Chiltern long tunnel

will be running almost continuously in groundwater which acts as a good coolant compared with what is occurring in London with the Underground heating up in clay. You get a much greater cooling effect just by the fact that it is in the groundwater. Whether you make use of that cooling is a matter of technical design, but there is an opportunity to be taken and I do not know whether that has been taken into account.

607. MR MOULD QC (DfT): I am not sure whether it has or has not, and how far that would obviate the need for mechanical cooling is a moot point. What we can say is that on the costings we are agreed upon, subject to Sir Peter's earlier caveat – that is to say, the cost of construction of the Bill scheme – and subject to those costs that come below Mr Payne's 'but', neither party has seen fit to attribute any material increase or decrease in those costs associated with these operational considerations?

608. MR BLAINE: That is right.

609. MR CLIFTON-BROWN: Is it not the case that the actual energy costs of putting the train through the tunnel would be significantly greater than just operating the fans and cooling the tunnel?

610. MR BLAINE: Yes, absolutely. In our view, the operation of the train is a much greater consumer of energy than the operation of the ventilation – the fans and so on – which is why cooling has not been a major feature of analysis, picking up your point, in terms of how long the tunnel should be and what the solution should be. There has been an overall judgment that the tunnel could be this long and the cost is about right, but the details of the operation in terms of the operational costs have not come out until recently: the cooling, the air quality in trains and other more detailed things. They may have been in the background, but they have never been mentioned in particular as a reason for the tunnel not being longer than the 13 kilometres it is at the moment.

611. SIR PETER BOTTOMLEY: Mr Timothy Mould can speak for the promoters, but he raises interesting issues that are clearly relevant and valuable. I was only going through a 'goose and gander' thing, which is whether the points that have been put to you are ones which the promoters themselves covered when they brought forward their extended tunnelling proposals earlier on. It is not a big point. The second thing, which is the overall intent, is that it is clearly right, bearing in mind the evidence of your predecessor, for us to be reminded that because a railway goes through an area of

exceptional natural importance there is not a price you put on that. It is not as if you are buying land. Well, you are actually buying land from farmers, but the costs are not monetised, which is what has been done. The third thing is that if either the promoters or the Committee were minded to go for a long tunnel, who gains what from spending the extra money: the environment, the people, the farmers? I doubt that some of the relatively small things are ones that matter enormously. A bigger decision has to be made.

612. MR MOULD QC (DfT): If it is helpful, we agree with that, and our approach is to look at those headline costs that I think we discussed earlier. I know there is one other item that is coming in a moment, which is the monetised economic effects to which Mr McCartney is going to speak. What I will do is see whether, when we come to hear Mr Smart on these matters, we can give you a little more help.

613. MR CLIFTON-BROWN: Surely, the cost of operating fans in the tunnel is an extremely small figure compared with the cost of putting a train through the tunnel.

614. MR BLAINE: I would agree with that.

615. MR CLIFTON-BROWN: It is negligible in comparison.

616. MR BLAINE: Yes.

617. MR MOULD QC (DfT): I will ask Mr Smart to comment on that.

618. MR STRAKER QC: Mr Blaine, arising out of that, a point has just been made about how the costs of the fans and so forth pale into insignificance by reference to the cost of moving the train through the tunnel along the track.

619. MR BLAINE: It is the cost of moving the trains on the surface or in the tunnel.

620. SIR PETER BOTTOMLEY: Is more power required to move a train through a tunnel than on the surface?

621. MR BLAINE: The calculations indicate that there is an increased energy cost, but because of the alignment of the Chiltern tunnel you are saving that cost.

622. SIR PETER BOTTOMLEY: It might be calculated and discussed, but it is not

vital?

623. MR BLAINE: Yes.

624. MR CLIFTON-BROWN: Is there not drag on the tunnel wall?

625. MR BLAINE: There is drag on the tunnel wall which increases resistance and also cooling issues have been raised, but on balance because of the gradients and alignment we are talking about we believe this offers a very good compromise or counter to that.

626. MR MOULD QC (DfT): If the position of Mr Blaine, with his characteristic fairness, is that, broadly speaking, the increased cost of climbing and descending is essentially cancelled out by the increased cost of going through an extended length of tunnel, by definition the Committee does not really need to worry about it very much.

627. SIR PETER BOTTOMLEY: It will not be the determining issue.

628. MR MOULD QC (DfT): Quite.

629. CHAIR: Mr Blaine, you got through that very quickly, and like most engineers you actually answer questions, or try to. We are going to take a five-minute break, take one more of your witnesses and then a longer break before we begin the evening session.

Sitting suspended

On resuming—

630. MR STRAKER QC: Mr Paul McCartney has taken his place next to me. I will ask for slide 1180(1) be put up where the starting question as to the purpose of the evidence is shown. That is answered in the next slide to present the socioeconomic costs. The third slide, 1180, introduces Mr McCartney and gives us his qualifications and the fact he is director of economics with Peter Brett Associates LLP.

631. MR STRAKER QC: Let's get straight into the Chiltern economy, if we may.

632. SIR PETER BOTTOMLEY: Before you do that, may I just show off for a moment by saying that the book that nobody has read on social economics by Walter Hagenbuch starts with the sentence, 'Social economics is what social economists do.'