SoR Reference5.5 Chapter 16 - Transport Assessment of likely significant effects

16.10 Assessment of likely significant effects

Construction

Construction Traffic Flows

16.10.1 In advance of a detailed construction programme estimates have been made of the vehicular activity anticipated to occur during the Scheme construction period. HGV movements are based on estimated volumes of material (spoil/fill and construction materials) that will be imported/exported via the highway network.

16.10.2 A total of 14 site access points has been identified along the Scheme and are illustrated in Figure 16.7 and outlined in Table 16.11.

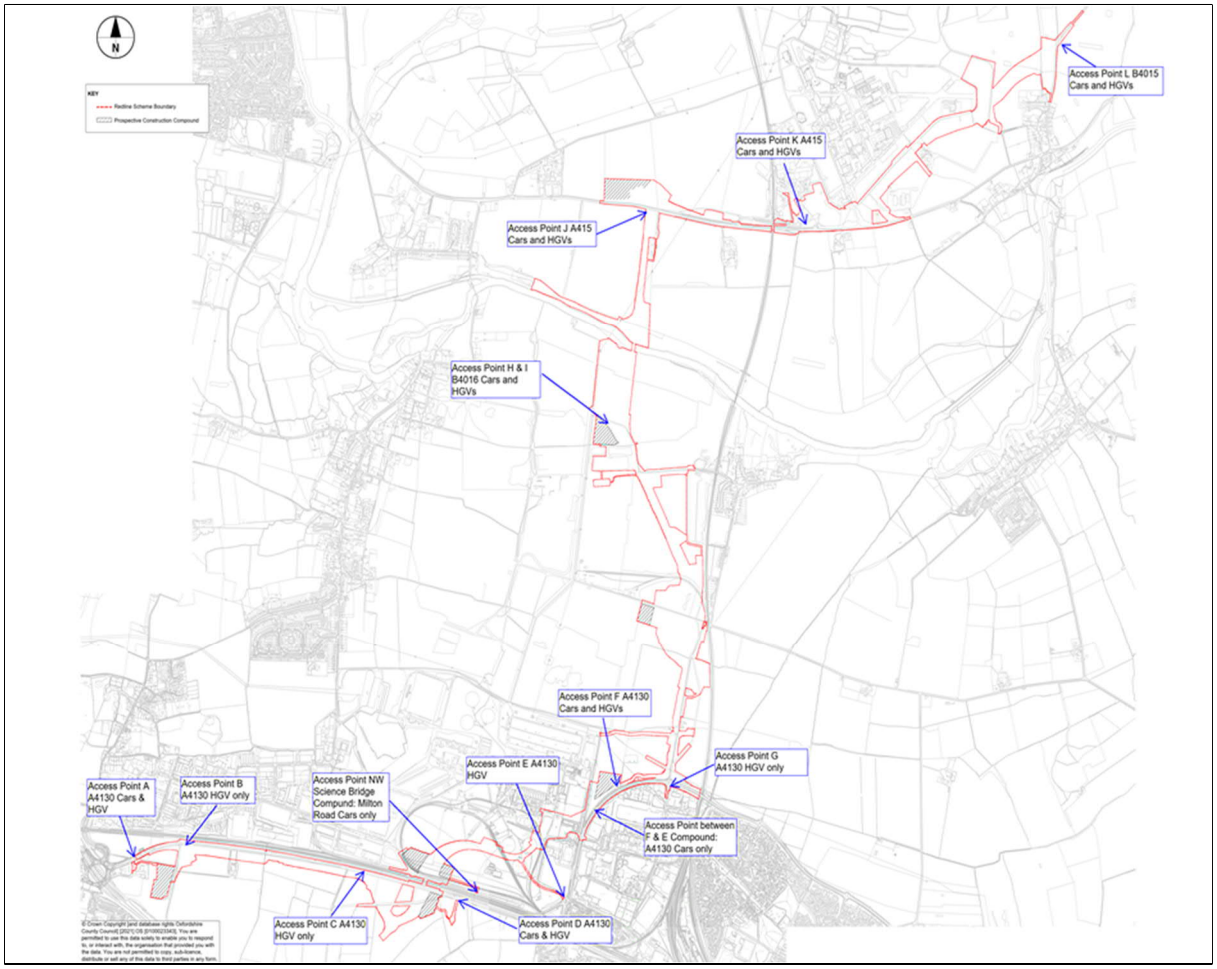

Figure 16.7: Construction Access Points

16.10.3 The ECI Contractor has provided an estimate of the monthly vehicle movements at each access point, for both cars/ Large Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGV). Car/ LGV movements are predominantly related to staff travelling to and from the Site, whilst it has been assumed that the import and export of materials is by HGV. To calculate average daily construction vehicle trips it has been assumed that the monthly vehicle trips will be equally distributed over 20 working days per month. These vehicle trips have been distributed onto the local highway network, taking into consideration existing weight and width restrictions.

Table 16.11: Construction Access Points

Access	Location	Type	Average Daily Cars / LGVs	Average Daily HGVs
Access A	A4130	HGV & Car/ LGV	130	11
Access B	A4130	HGV	-	28
Access C	A4130	HGV	-	13
Access D	A4130	HGV & Car/ LGV	80	33
NW Science Bridge Compound	Milton Road	Car/ LGV	200	-
Access E	A4130	HGV	-	10
Access Between F & E	A4130	Car/ LGV	80	-
Access F	A4130	HGV & Car/ LGV	221	46
Access G	A4130	HGV	-	6
Access H	B4016	HGV	-	44
Access I	B4016	HGV & Car/ LGV	112	22
Access J	A415	HGV & Car/ LGV	96	40
Access K	A415	HGV & Car/ LGV	220	71
Access L	B4015	HGV & Car/ LGV	20	9

16.10.4 The HGV access points and routes on the local highway network that do not have weight or width restrictions are shown in Figure 16.8.

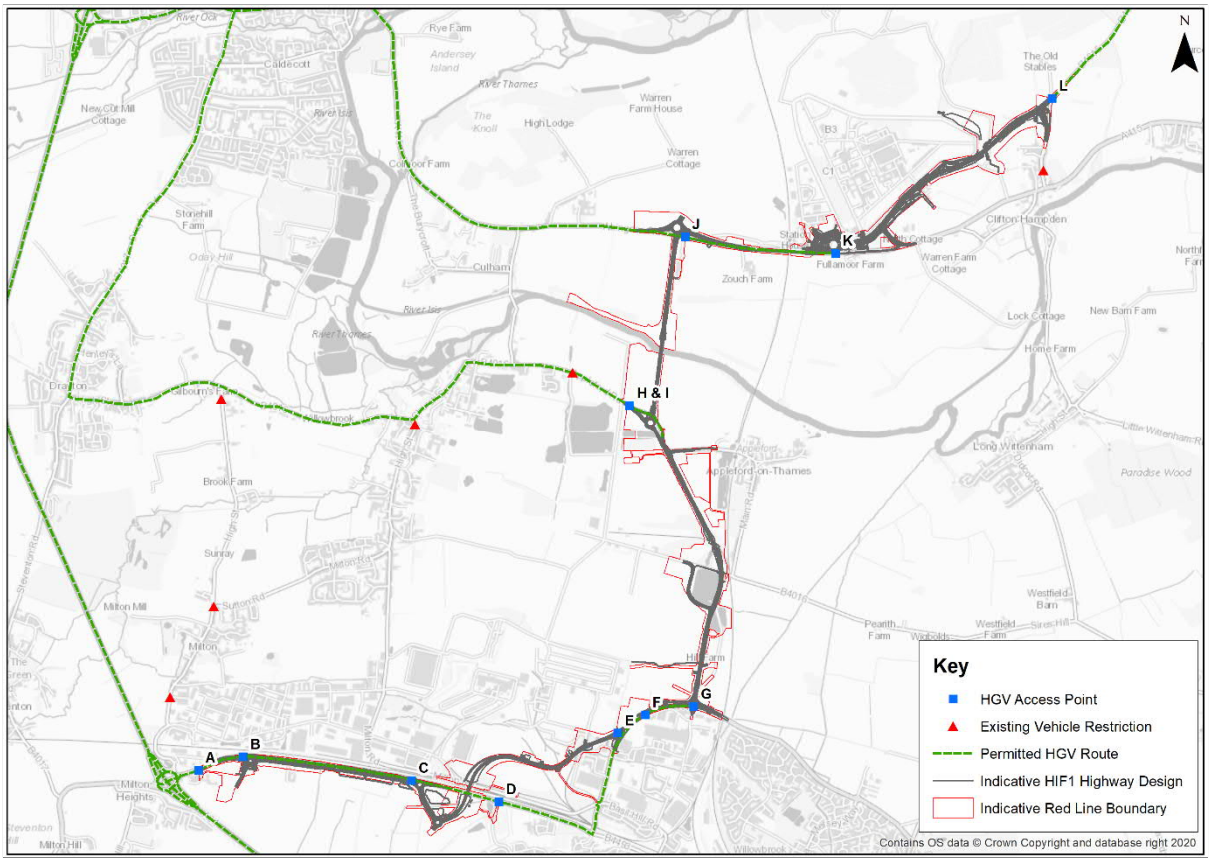

Figure 16.8: Construction HGV Access

16.10.5 It has been assumed that HGVs will use Milton Interchange and the A4130 for access points A to G. To avoid existing weight restrictions on High Street through Milton, access to access points I and H, located between Sutton Courtenay and Appleford, will be via Marcham Interchange on the A34, then the B4017 to Drayton and Drayton Road/ Appleford Road. There is an existing 7.5t weight restriction (except for access) on Appleford Road to the east of the Hanson site access. To access the Site, it has been assumed that this weight restriction will be moved temporarily to access point H, and that HGVs will not be permitted east of this point, thereby maintaining the restriction through Appleford.

16.10.6 HGVs will access Site accesses J and K via Marcham Interchange and the A415 Abingdon Road. Access to Site access L will be via the A4074. There is an existing 7.5t weight restriction (except for access) on the A4074 to the west of the Notcutts Garden Centre access. It has been assumed that this will temporarily be re-located to Site access L, with HGVs restricted to the west of this point thereby maintaining the restriction through Clifton Hampden.

16.10.7 To determine AM and PM peak hour construction vehicle trips, it has been assumed that daily HGV movements will be distributed evenly across a 10-hour day. Construction staff will generally arrive on Site between 07:00-08:00 and depart in the evening between 16:00-18:00. To estimate AM peak hour car/ LGV trips a robust estimate of 20% of vehicle arrivals has been assumed to occur between 08:00-09:00, and to estimate PM peak hour car/LGV trips it has been assumed that 60% will occur between 17:00-18:00.

16.10.8 Through the implementation of the CTMP construction traffic will be managed to minimise impacts on the local network. It is anticipated that traffic increases will be significantly below 30%, with a maximum increase of 8% on any link and less on the majority of the local network, as shown in Table 16.12, resulting in a negligible magnitude of change according to IEMA guidance.

16.10.9 Table 16.12 sets out the maximum daily construction traffic forecast to occur on each of the links in 2024 to provide a robust assessment. These levels of traffic are not forecast to be present during the entire 25-month construction period and the maximum levels of traffic on all links are also not forecast to occur during the same months. The peak number of construction HGVs for the Scheme is forecast to occur in month seven. The peak number of cars / LGVs is forecast to occur for months one to 10.

16.10.10 The vehicle profile for the vehicles associated with the construction of the Scheme is presented in Figure 16.9.

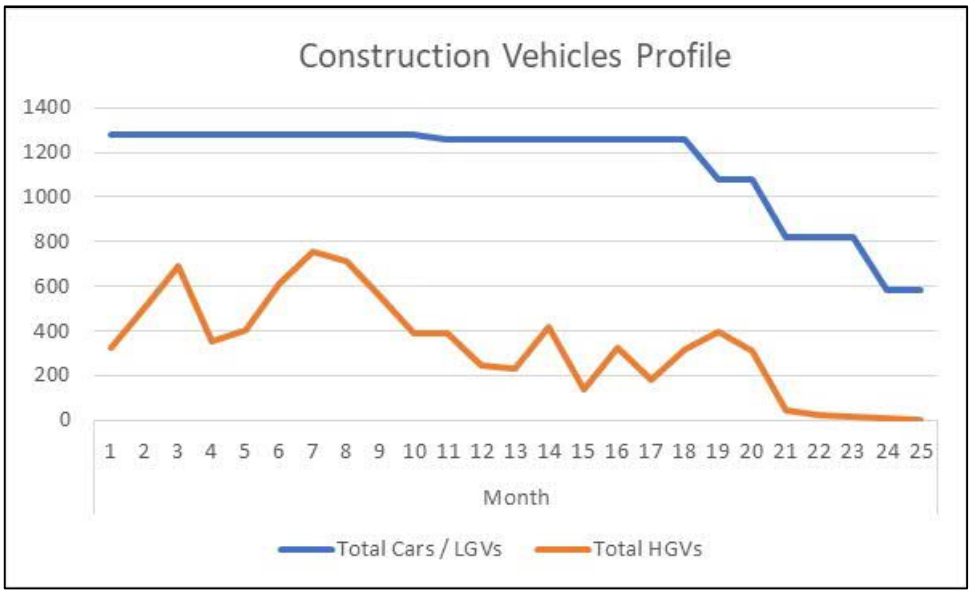

Figure 16.9: Construction Vehicles Profile

Table 16.12: 2024 Daily Construction Traffic Flows

Link		2024 DN Total Traffic (2-Way)	2024 DN + Construction Total Traffic (2-Way)	Absolute Difference	Percentage Difference	2024 DN HGVs (2-Way)	2024 DN + Construction HGVs (2-Way)	Absolute Difference (HGVs)	Percentage Difference (HGVs)
1	A34 (North)	71,116	71,804	688	1%	2,811	3,187	376	13%
2	A34 (mid-junction)	40,782	41,048	266	1%	1,218	1,484	266	22%
3	A34 (South)	49,809	50,643	834	2%	1,887	2,263	376	20%
4	A34 On-Slip (NB)	15,847	16,156	310	2%	717	870	154	21%
5	A34 Off-Slip (SB)	14,495	14,804	310	2%	875	1,029	154	18%
6	A34 On-Slip (SB)	4,212	4,595	383	9%	289	442	154	53%
7	A34 Off-Slip (NB)	4,809	5,192	383	8%	379	533	154	40%
8	A4130 (W)	21,723	21,723	0	0%	925	925	0	0%
9	Park Drive	17,666	17,972	306	2%	828	828	0	0%
10	A4130 (E)	30,989	32,067	1,078	3%	2,439	3,053	614	25%
11	A4130	26,559	27,673	1,114	4%	2,076	2,690	614	30%
12	A4130	26,567	27,537	970	4%	2,078	2,692	614	30%
13	A4130	26,390	27,194	803	3%	2,079	2,510	431	21%
14	A4130	25,256	25,754	498	2%	2,051	2,240	190	9%
15	B4493	23,788	23,944	156	1%	838	838	0	0%
16	Mendip Heights	1,444	1,444	0	0%	37	37	0	0%
17	A4130	20,890	21,439	550	3%	2,110	2,299	190	9%
18	A4130	18,187	18,697	510	3%	1,631	1,820	190	12%
19	A4130	16,055	16,564	509	3%	1,244	1,433	189	15%
20	A4130	15,240	15,307	67	0%	559	626	67	12%

Link		2024 DN Total Traffic (2-Way)	2024 DN + Construction Total Traffic (2-Way)	Absolute Difference	Percentage Difference	2024 DN HGVs (2-Way)	2024 DN + Construction HGVs (2-Way)	Absolute Difference (HGVs)	Percentage Difference (HGVs)
21	A4130	12,174	12,174	0	0%	474	474	0	0%
22	Milton Road	14,496	14,536	40	0%	844	844	0	0%
23	Basil Hill Road	2,732	2,732	0	0%	468	468	0	0%
24	Lady Grove	10,019	10,019	0	0%	141	141	0	0%
25	B4016	5,573	5,601	28	1%	112	112	0	0%
26	B4016	5,585	5,613	28	1%	112	112	0	0%
27	Sires Hill	11,545	11,573	28	0%	83	83	0	0%
28	Saxons Heath	11,059	11,059	0	0%	32	32	0	0%
29	B4016 High Street	10,914	10,914	0	0%	106	106	0	0%
30	Harwell Road	8,182	8,196	0	0%	384	384	0	0%
31	High Street	7,602	7,616	0	0%	401	401	0	0%
32	B4016 Church Street	9,957	10,215	258	3%	490	602	112	23%
33	B4016 Appleford Rd	5,565	5,789	224	4%	110	222	112	102%
34	Tollgate Road	7,650	7,796	146	2%	423	423	0	0%
35	A415 Abingdon Road	11,133	11,433	300	3%	387	541	154	40%
36	A415 Abingdon Road	11,017	11,411	394	4%	470	624	154	33%
37	A415 Abingdon Road	10,910	11,315	406	4%	464	590	126	27%
38	A415 Abingdon Road	11,423	11,603	180	2%	478	478	0	0%
39	A415 Abingdon Road	7,349	7,379	30	0%	346	346	0	0%
40	B4015 Oxford Road	9,344	9,439	95	1%	178	178	0	0%
41	B4015 Oxford Road	9,337	9,477	140	1%	178	223	45	25%

16.10.11 Table 16.12 indicates that the daily total traffic flows in the local area in 2024 are not forecast to increase more than 10% with the traffic associated with the construction of the Scheme.

16.10.12 In addition, Table 16.12 indicates that five of the 41 links are forecast to experience an increase in daily HGV traffic of greater than 30%, which meets IEMA Rule 2 for further assessment. The greatest increase in daily HGV traffic is forecast on the B4016 Appleford Road (link 33: 102%), this is located to the west of construction Access H and I. There is an existing 7.5t weight restriction (except for access) on this link to the east of the Hanson quarry access, and therefore the baseline HGV traffic on this link is low. The construction traffic will not travel east beyond the proposed site access points and through Appleford, and therefore the impact will be limited to a short section of the B4016 between the Hanson access and the proposed site access.

16.10.13 The southbound A34 On-Slip and the northbound A34 Off-Slip at Milton Interchange are forecast to experience an increase of 154 daily HGVs, equating to a 53% and a 40% increase respectively in 2024 with the construction of the Scheme. If the HGVs are spread evenly across the 10-hour working day this equates to approximately 15 HGVs per hour. This level of HGV traffic is forecast to occur on these slip roads for only month 3 of the construction period. The average number of daily construction HGVs forecast to use the southbound A34 On-Slip and the northbound A34 Off-Slip at Milton Interchange during the entire construction period is 37 HGVs which equates to 13% and 10% increase in daily HGV traffic flows in 2024.

16.10.14 Link 35 and 36 (A415 Abingdon Road) are forecast to experience an increase of 154 daily HGVs equating to a 40% and 33% increase in daily traffic flows respectively. This increase equates to approximately 15 HGVs per hour across a 10-hour working day. However, this level of construction HGVs are only forecast for month 6 of the construction period. The average number of daily construction HGVs forecast to use the A415 Abingdon Road at this location is 56 HGVs, which equates to a 14% and 12% increase in daily HGV traffic flows respectively.

Driver Delay during construction

16.10.15 During the construction of the Scheme there may be lane closures where works need to be undertaken on or adjacent to existing carriageway. This is most likely to occur at the following locations:

- On the A4130 between Milton Interchange the proposed Didcot Science Bridge as part of the A4130 Widening Scheme;
- The A4130/ Hawksworth/ Purchas Road roundabout;
- The A4130 between the A4130/ Hawksworth/ Purchas Road roundabout and the A4130/ Collett roundabout;
- B4016 Appleford Road at the location of the proposed roundabout; and
- A415 Abingdon Road between the proposed roundabouts.

16.10.16 These closures will be temporary whilst construction works on the existing highway are undertaken. It is not known at this time how long the closures at each location will last, however, these will be managed by the principal contractor and appropriate signage or alternative routes will be provided to reduce delays. Through the design process changes to some of the junctions were made, such as moving them off-line, enabling them to be constructed with less impact on the existing highway network.

16.10.17 For the majority of construction, the working hours will be between 07:30 and 18:00, and therefore it is expected that most staff will arrive at the Site before the highway peak hour. It is also anticipated that some staff will start leaving the Site before 16:00 and after 18:00, resulting in less construction staff traffic travelling during the highway peak hours and reducing any driver delay. There may be times where work outside the standard hours is required, for bridge construction, railway possessions, etc. Any work outside standard hours will be agreed in advance with the highway authority through the CEMP.

16.10.18 During the AM highway peak hour (08:00-09:00) the maximum number of cars/ LGVs forecast to be generated at a single location within the extent of the assessment is 50 vehicles which equates to less than one additional vehicle per minute. This increase in cars and LGVs is only forecast to occur on the A4130 to the east of Milton Interchange and Access A. This level of cars/ LGVs associated with the construction of the Scheme is only forecast to occur for 18 months and will therefore only have a temporary impact on driver delay.

16.10.19 In the PM highway peak hour (17:00-18:00), the construction of the Scheme is forecast to generate a maximum of 150 vehicles at a single point within the extent of the assessment. This equates to approximately 2.5 additional vehicles per minute. This is forecast to occur on the A4130 to the east of Milton Interchange and Access A. This level of cars/ LGVs associated with the construction of the Scheme is only forecast to occur for 18 months and will therefore only have a temporary impact on driver delay.

16.10.20 In terms of HGVs associated with the construction of the Scheme, these will be managed through the CTMP to reduce any impact during the highway peak hour. The HGVs will be managed to ensure that they stay on the strategic highway network for as long as possible to reduce the impact on rural roads in the local area.

16.10.21 As stated above, it has been assumed that the HGV deliveries will arrive evenly over a 10-hour working day. It is therefore forecast that the maximum number of HGVs forecast to be generated at a single point along the highway network is 61 per hour which equates to approximately one additional HGV per minute. This is anticipated to occur along the A4130 to the east of Milton Interchange and for only a short period of construction. Therefore, any impact on driver delay caused by HGVs associated with the construction will be temporary.

16.10.22 Overall, it is considered that the magnitude of impact on driver delay is negligible and the overall significance of effect during Scheme construction is negligible.

Accidents and Safety during construction

16.10.23 In accordance with the methodology outlined in Section 16.4, accidents and safety in terms of vehicle travellers has been assessed quantitatively in Table 16.13, with reference also being made to the PIC data for the most recent five-year period available.

16.10.24 The change in AADT due to the construction of the Scheme in 2024 is set out in Table 16.13 and identifies the resultant forecast magnitude of change and significance of effect in terms of accidents and safety.

Table 16.13: Accidents and Safety (2024 AADT)

Link		2024 DN (2-Way)	2024 DN + Construction (2-Way)	Absolute Difference	Percentage Difference	Magnitude	Sensitivity	Significance
1	A34 (North)	71,116	71,804	688	1%	No Impact	High	No Impact
2	A34 (mid-junction)	40,782	41,048	266	1%	No Impact	High	No Impact
3	A34 (South)	49,809	50,643	834	2%	No Impact	High	No Impact
4	A34 On-Slip (NB)	15,847	16,156	310	2%	No Impact	Very Low	No Impact
5	A34 Off-Slip (SB)	14,495	14,804	310	2%	No Impact	Low	No Impact
6	A34 On-Slip (SB)	4,212	4,595	383	9%	No Impact	Very Low	No Impact
7	A34 Off-Slip (NB)	4,809	5,192	383	8%	No Impact	Low	No Impact
8	A4130 (W)	21,723	21,723	0	0%	No Impact	Medium	No Impact
9	Park Drive	17,666	17,972	306	2%	No Impact	Very Low	No Impact
10	A4130 (E)	30,989	32,067	1,078	3%	No Impact	Medium	No Impact
11	A4130	26,559	27,673	1,114	4%	No Impact	Medium	No Impact
12	A4130	26,567	27,537	970	4%	No Impact	Medium	No Impact
13	A4130	26,390	27,194	803	3%	No Impact	Medium	No Impact
14	A4130	25,256	25,754	498	2%	No Impact	Medium	No Impact
15	B4493	23,788	23,944	156	1%	No Impact	Medium	No Impact
16	Mendip Heights	1,444	1,444	0	0%	No Impact	Very Low	No Impact
17	A4130	20,890	21,439	550	3%	No Impact	Medium	No Impact
18	A4130	18,187	18,697	510	3%	No Impact	Medium	No Impact
19	A4130	16,055	16,564	509	3%	No Impact	Medium	No Impact
20	A4130	15,240	15,307	67	0%	No Impact	Medium	No Impact

Link		2024 DN (2-Way)	2024 DN + Construction (2-Way)	Absolute Difference	Percentage Difference	Magnitude	Sensitivity	Significance
21	A4130	12,174	12,174	0	0%	No Impact	Medium	No Impact
22	Milton Road	14,496	14,536	40	0%	No Impact	Very Low	No Impact
23	Basil Hill Road	2,732	2,732	0	0%	No Impact	Very Low	No Impact
24	Lady Grove	10,019	10,019	0	0%	No Impact	Very Low	No Impact
25	B4016	5,573	5,601	28	1%	No Impact	Low	No Impact
26	B4016	5,585	5,613	28	1%	No Impact	Low	No Impact
27	Sires Hill	11,545	11,573	28	0%	No Impact	Very Low	No Impact
28	Saxons Heath	11,059	11,059	0	0%	No Impact	Very Low	No Impact
29	B4016 High Street	10,914	10,914	0	0%	No Impact	Low	No Impact
30	Harwell Road	8,182	8,196	0	0%	No Impact	Very Low	No Impact
31	High Street	7,602	7,616	0	0%	No Impact	Very Low	No Impact
32	B4016 Church Street	9,957	10,215	258	3%	No Impact	Low	No Impact
33	B4016 Appleford Road	5,565	5,789	224	4%	No Impact	Low	No Impact
34	Tollgate Road	7,650	7,796	146	2%	No Impact	Very Low	No Impact
35	A415 Abingdon Road	11,133	11,433	300	3%	No Impact	Medium	No Impact
36	A415 Abingdon Road	11,017	11,411	394	4%	No Impact	Medium	No Impact
37	A415 Abingdon Road	10,910	11,315	406	4%	No Impact	Medium	No Impact
38	A415 Abingdon Road	11,423	11,603	180	2%	No Impact	Medium	No Impact
39	A415 Abingdon Road	7,349	7,379	30	0%	No Impact	Medium	No Impact
40	B4015 Oxford Road	9,344	9,439	95	1%	No Impact	Low	No Impact
41	B4015 Oxford Road	9,337	9,477	140	1%	No Impact	Low	No Impact

16.10.25 Table 16.13 indicates that the Annual Average Daily Traffic (AADT) flows are not forecast to increase more than 10% on all links within the extent of the assessment.

16.10.26 As noted previously, the PIC data does not indicate any significant safety design issues, while the change in traffic flow is considered negligible and not resulting in a significant increase in turning movements within the scheme extents.

16.10.27 It is therefore considered that the overall impact of accidents and safety on vehicle travellers in negligible during the construction period.

Public Transport Users

16.10.28 It is anticipated that the number of construction personnel travelling to the site by public transport (i.e. bus and rail) will be low, as access to the site compounds by public transport is not convenient due to lack of stops/ no bus services in the vicinity of some of the compounds. Therefore, the magnitude of the impact of increased bus patronage by construction personnel will be negligible.

16.10.29 The significance of effects on the capacity of existing bus and rail services will therefore be negligible. It is also expected that the level of traffic generated during the Scheme construction phase will have a negligible impact on bus journey times; temporary re-routing of bus routes and/or closure/relocation of bus stops is not anticipated.

16.10.30 It is considered that the overall effect during construction of the Scheme on public transport users is negligible which is not significant.

Operation

Operational Traffic Flows

16.10.31 The daily 2034 with and without scheme traffic flows are presented in Table 16.14.

Table 16.14: 2034 Daily Two-Way Traffic Flows

Link		All Vehicles				HGVs			
		2034 DN	2034 DS	Absolute Difference	Percentage Difference	2034 DN	2034 DS	Absolute Difference	Percentage Difference
1	A34 (North)	86,063	76,931	-9,132	-11%	3,414	2,894	-520	-15%
2	A34 (mid-junction)	46,921	40,454	-6,467	-14%	1,547	1,290	-257	-17%
3	A34 (South)	57,133	49,622	-7,511	-13%	2,490	2,026	-463	-19%
4	A34 On-Slip (NB)	21,041	19,093	-1,948	-9%	0	718	718	0%
5	A34 Off-Slip (SB)	18,025	17,386	-639	-4%	1,081	885	-195	-18%
6	A34 On-Slip (SB)	4,940	4,530	-411	-8%	402	354	-48	-12%
7	A34 Off-Slip (NB)	5,071	4,638	-433	-9%	530	381	-149	-28%
8	A4130 (W)	28,490	25,507	-2,983	-10%	1,377	1,181	-196	-14%
9	Park Drive	22,092	19,722	-2,370	-11%	1,036	893	-143	-14%
10	A4130 (E)	39,258	39,598	340	1%	3,022	2,704	-318	-11%
11	A4130	35,883	36,546	663	2%	2,756	2,428	-328	-12%
12	A4130	36,073	36,187	114	0%	2,742	2,501	-241	-9%
13	A4130	32,840	35,625	2,784	8%	2,728	2,522	-206	-8%
14	A4130	29,069	16,187	-12,883	-44%	2,653	848	-1,805	-68%
15	B4493	27,287	20,994	-6,293	-23%	956	555	-400	-42%
16	Mendip Heights	1,992	1,887	-104	-5%	50	48	-2	-5%
17	A4130	27,703	11,242	-16,462	-59%	2,765	670	-2,094	-76%
18	A4130	20,531	7,018	-13,513	-66%	1,982	131	-1,850	-93%
19	A4130	17,962	25,523	7,561	42%	1,585	1,967	382	24%
20	A4130	17,124	25,711	8,587	50%	817	730	-87	-11%

Link		All Vehicles				HGVs			
		2034 DN	2034 DS	Absolute Difference	Percentage Difference	2034 DN	2034 DS	Absolute Difference	Percentage Difference
21	A4130	13,855	15,927	2,072	15%	730	624	-106	-14%
22	Milton Road	19,184	14,521	-4,663	-24%	1,257	605	-651	-52%
23	Basil Hill Road	3,333	6,142	2,809	84%	528	492	-36	-7%
24	Lady Grove	14,171	5,439	-8,732	-62%	342	61	-281	-82%
25	B4016	9,077	3,083	-5,993	-66%	193	2	-191	-99%
26	B4016	9,594	3,087	-6,506	-68%	195	2	-194	-99%
27	Sires Hill	18,625	6,853	-11,773	-63%	251	63	-189	-75%
28	Saxons Heath	18,071	3,712	-14,359	-79%	186	1	-184	-99%
29	B4016 High Street	18,202	3,671	-14,531	-80%	307	99	-208	-68%
30	Harwell Road	14,293	7,134	-7,159	-50%	614	134	-479	-78%
31	High Street	13,340	6,429	-6,911	-52%	687	166	-521	-76%
32	B4016 Church Street	16,388	10,823	-5,564	-34%	787	333	-454	-58%
33	B4016 Appleford Road	9,771	10,364	593	6%	155	490	335	217%
34	Tollgate Road	11,569	3,061	-8,508	-74%	729	210	-518	-71%
35	A415 Abingdon Road	10,484	14,893	4,408	42%	450	575	125	28%
36	A415 Abingdon Road	14,510	16,369	1,859	13%	672	675	2	0%
37	A415 Abingdon Road	15,886	29,919	14,032	88%	641	808	167	26%
38	A415 Abingdon Road	17,436	2,384	-15,051	-86%	665	48	-617	-93%
39	A415 Abingdon Road	13,259	2,139	-11,120	-84%	409	41	-369	-90%
40	B4015 Oxford Road	14,626	2,481	-12,145	-83%	449	71	-377	-84%
41	B4015 Oxford Road	14,741	27,640	12,898	87%	451	784	333	74%

16.10.32 Table 16.14 indicates that six of the 41 links are forecast to experience an increase in total daily traffic flows of greater than 30% in 2034 with the implementation of the Scheme, and 15 links are forecast to experience a decrease of 30% or more.

16.10.33 In the DN scenario congestion occurs across the network and this results in some link flows being low, as traffic is unable complete their journey as it is held up in queues elsewhere.

16.10.34 Link 37 (A415 Abingdon Road between the New Thames River Crossing / A415 roundabout and the A415 / Clifton Hampden Bypass / CSC roundabout) is forecast to experience an 88% increase in daily traffic flows in 2034 with the implementation of the Scheme. This is due to the Scheme providing a more direct and desirable route to access CSC and providing another crossing point across The River Thames. Without the Scheme there is severe congestion in this area, resulting in a lower modelled flow on the link as vehicles are queuing and therefore fewer can travel on the link across a time period.

16.10.35 Link 23 (Basil Hill Road) is shown to experience an 84% increase in daily traffic flows in 2034 with the implementation of the Scheme. This apparent increase is considered to be caused by the new route north/south over the River Thames that the scheme provides, which enables residents from existing housing in central Didcot to travel here instead of through the villages north of Didcot, as shown by reductions on links 24 and 30. The 84% increase is due to the flows being low in the DN, the absolute difference is 2,809 daily two-way flows, which is considered low. The A4130 / Basil Hill Road / Milton Road (Power Station) roundabout has been assessed in this section to determine if the Scheme has an effect on driver delay and accidents and safety.

16.10.36 Link 41 (B4015 Oxford Road) is forecast to experience an 87% increase in total daily traffic flows in 2034 with the implementation of the Scheme. The Scheme enables a route choice change, as can be seen by the 84% decrease in trips on the alternative route through Burcot (link 39). Other links within Clifton Hampden and Long Wittenham (29, 38, 40) also experience decreases of over 80%. Traffic flows through Sutton Courtenay (links 30, 31 and 32) experience reductions of between 34% to 52% and flows over the existing river crossing at Culham (link 34) reduce by 74%.

16.10.37 Table 16.14 also indicates that two of the 41 links are forecast to experience an increase in daily HGV traffic of greater than 30% in 2034 with the implementation of the Scheme. The B4016 Appleford Road to the west of the New Thames River Crossing / B4016 roundabout (link 33) is forecast to experience a 217% increase in HGV traffic in 2034 with the implementation of the Scheme. This increase only relates to the section up to the roundabout connecting to the new Scheme and flows through Appleford (link 26) reduce significantly.

16.10.38 The B4015 Oxford Road (link 41) is forecast to experience an 74% increase in daily HGV traffic flows in 2034 with the implementation of the Scheme. This is due to the Scheme providing an alternative route to the A4074, as shown by the 90% decrease on link 39 (Burcot). The Scheme provides a more desirable route for HGVs, rerouting them away from the villages of Clifton Hampden and Burcot.

Driver Delay

16.10.39 The effect on driver delay is measured at the junctions on the highway network in the vicinity of the Scheme. The total junction delay has been calculated using the junction capacity assessments undertaken as part of the Transport Assessment. The additional driver delay forecast for each junction 10 years after the Scheme is complete is presented in Table 16.15.

16.10.40 The sensitivity of the receptors ranges from very low to high (refer to paragraph 16.4.10), and the magnitude of change ranges from negligible to high (refer to paragraph 16.4.15). In accordance with Table 16.2, the significance of the effect on driver delay is presented in Table 16.15 and ranges from negligible to major beneficial.

16.10.41 In accordance with IEMA Guidance (Ref 16.9), delays are only likely to be significant when the traffic on the network surrounding the Scheme is already at or close to the capacity of the system.

Table 16.15: Driver Delay (2034)

Junction		Driver Delay (seconds)					Magnitude	Sensitivity	Significance
		2034 DM AM Peak	2034 DS AM Peak	2034 DM PM Peak	2034 DS PM Peak	Ave.			
OFF 2	A4130/ Service Area	16	3	3	1	-8	Negligible	Very Low	Negligible
OFF 3	A4130/Milton Gate	356	9	735	6	-227	High	Low	Moderate Beneficial
OFF 4	A4130/ B4493/ Mendip Heights	935	10	712	74	-828	High	Very Low	Minor Beneficial
OFF 5	A4130/ Basil Hill Road/ Milton Road (Power Station)	844	59	1,159	72	-736	High	High	Major Beneficial
OFF 6 & OFF 7	A415/ High Street (Clifton Hampden)	1,196	6	58	6	-1112	High	High	Major Beneficial
OFF 8	Harwell Road/ Milton Road/ High Street	40	11	1,917	15	-43	High	Very Low	Minor Beneficial
OFF 9	B4493/ Foxhall Road	2,821	13	2,553	51	-2,655	High	High	Major Beneficial
OFF 10 & OFF 11	B4016 Appleford Road/ Abingdon Rd	239	35	84	23	-133	High	High	Major Beneficial
	A415/ Tollgate Road								
OFF 12	A4130/ Lady Grove	5	22	25	15	2	Negligible	High	Negligible
OFF 13	Lady Grove/ Sires Hill	99	8	5	6	-53	High	Medium	Major Beneficial
OFF 14	Sires Hill/ Didcot Road	40	17	32	8	-43	High	Very Low	Minor Beneficial

16.10.42 Table 16.15 indicates the following:

- The Scheme is forecast to result in moderate and major beneficial effects on driver delay at several junctions, due to traffic re-routing onto the Scheme and away from other congested parts of the network.
- Major beneficial effects are predicted in Didcot at the A4130/B4493/Mendip Heights (OFF 4) and A4130/Basil Hill Road/Milton Road (OFF 5) junctions; at the B4493/Foxhall Road (OFF 9) junction in Sutton Courtenay; at the B4016 Appleford Road/Abingdon Road (OFF 10) and A415 Tollgate Road (OFF 11) junctions at either end of the river crossing at Culham; at the staggered signalised junction on the A415 in Clifton Hampden (OFF 6 & OFF 7); and at the Lady Grove/Sires Hill junction (OFF 13) between Didcot and Long Wittenham.

16.10.43 In total Eleven of the junctions included in the assessment are forecast to have a reduction in driver delay due to the re-routing of traffic, and one junction is forecast to have an increase in driver delay of only an average of two seconds across the peak hours, which is negligible. It is therefore considered that the overall effect of the Scheme on driver delay is major beneficial and thus significant.

Accidents and Safety

16.10.44 The impact of the operation of the Scheme on accidents and safety for vehicle travellers has been assessed quantitatively. The sensitivity of the receptors ranges from very low to high (refer to paragraph 16.4.12), and the magnitude of change ranges from negligible to high (refer to paragraph 16.4.21). The significance of the impact on accidents and safety is also presented in Table 16.16 and ranges from major beneficial to major adverse.

Table 16.16: Accidents and Safety (2034 AADT)

Link		2034 DN (2-Way)	2034 DS (2-Way)	Absolute Difference	Percentage Difference	Magnitude	Sensitivity	Significance
1	A34 (North)	86,063	76,931	-9,132	-11%	Low	High	Moderate Beneficial
2	A34 (mid-junction)	46,921	40,454	-6,467	-14%	Low	High	Moderate Beneficial
3	A34 (South)	57,133	49,622	-7,511	-13%	Low	High	Moderate Beneficial
4	A34 On-Slip (NB)	21,041	19,093	-1,948	-9%	No Impact	Very Low	No Impact
5	A34 Off-Slip (SB)	18,025	17,386	-639	-4%	No Impact	Low	No Impact
6	A34 On-Slip (SB)	4,940	4,530	-411	-8%	No Impact	Very Low	No Impact
7	A34 Off-Slip (NB)	5,071	4,638	-433	-9%	No Impact	Low	No Impact
8	A4130 (W)	28,490	25,507	-2,983	-10%	Low	Medium	Minor Beneficial
9	Park Drive	22,092	19,722	-2,370	-11%	Low	Very Low	Negligible
10	A4130 (E)	39,258	39,598	340	1%	No Impact	Medium	No Impact
11	A4130	35,883	36,546	663	2%	No Impact	Medium	No Impact
12	A4130	36,073	36,187	114	0%	No Impact	Medium	No Impact
13	A4130	32,840	35,625	2,784	8%	No Impact	Medium	No Impact
14	A4130	29,069	16,187	-12,883	-44%	High	Medium	Major Beneficial
15	B4493	27,287	20,994	-6,293	-23%	Medium	Medium	Moderate Beneficial
16	Mendip Heights	1,992	1,887	-104	-5%	No Impact	Very Low	No Impact
17	A4130	27,703	11,242	-16,462	-59%	High	Medium	Major Beneficial
18	A4130	20,531	7,018	-13,513	-66%	High	Medium	Major Beneficial
19	A4130	17,962	25,523	7,561	42%	High	Medium	Major Adverse
20	A4130	17,124	25,711	8,587	50%	High	Medium	Major Adverse
21	A4130	13,855	15,927	2,072	15%	Low	Medium	Minor Adverse

Link		2034 DN (2-Way)	2034 DS (2-Way)	Absolute Difference	Percentage Difference	Magnitude	Sensitivity	Significance
22	Milton Road	19,184	14,521	-4,663	-24%	Medium	Very Low	Negligible
23	Basil Hill Road	3,333	6,142	2,809	84%	High	Very Low	Minor Adverse
24	Lady Grove	14,171	5,439	-8,732	-62%	High	Very Low	Minor Beneficial
25	B4016	9,077	3,083	-5,993	-66%	High	Low	Moderate Beneficial
26	B4016	9,594	3,087	-6,506	-68%	High	Low	Moderate Beneficial
27	Sires Hill	18,625	6,853	-11,773	-63%	High	Very Low	Minor Beneficial
28	Saxons Heath	18,071	3,712	-14,359	-79%	High	Very Low	Minor Beneficial
29	B4016 High Street	18,202	3,671	-14,531	-80%	High	Low	Moderate Beneficial
30	Harwell Road	14,293	7,134	-7,159	-50%	High	Very Low	Minor Beneficial
31	High Street	13,340	6,429	-6,911	-52%	High	Very Low	Minor Beneficial
32	B4016 Church Street	16,388	10,823	-5,564	-34%	High	Low	Moderate Beneficial
33	B4016 Appleford Road	9,771	10,364	593	6%	No Impact	Low	No Impact
34	Tollgate Road	11,569	3,061	-8,508	-74%	High	Very Low	Minor Beneficial
35	A415 Abingdon Road	10,484	14,893	4,408	42%	High	Medium	Major Adverse
36	A415 Abingdon Road	14,510	16,369	1,859	13%	Low	Medium	Minor Adverse
37	A415 Abingdon Road	15,886	29,919	14,032	88%	High	Medium	Major Adverse
38	A415 Abingdon Road	17,436	2,384	-15,051	-86%	High	Medium	Major Beneficial
39	A415 Abingdon Road	13,259	2,139	-11,120	-84%	High	Medium	Major Beneficial
40	B4015 Oxford Road	14,626	2,481	-12,145	-83%	High	Low	Moderate Beneficial
41	B4015 Oxford Road	14,741	27,640	12898	87%	High	Low	Moderate Adverse

16.10.45 Table 16.16 indicates that 21 of the 41 links are forecast to experience a decrease in traffic flows with the implementation of the Scheme in 2034 resulting in minor to major beneficial effect on accidents and safety. Eight links are forecast to have an increase in traffic flows resulting in a minor to major adverse impact. In addition, 12 links are forecast to either have no impact or a negligible effect on accidents and safety.

16.10.46 Major adverse effects are forecast on the A4130 (links 19 and 20), and A415 Abingdon Road (link 37), and a moderate adverse impact is forecast on the A415 east of Clifton Hampden (link 41), as traffic diverts from local routes to use the new scheme, or traffic that is queueing in congestion without the scheme is enabled to travel along the link due to the improved highway operation. The scheme, including junctions along the route, has been designed to DMRB standards and subject to Road Safety Audits, and therefore is better able to accommodate the increase in traffic safely. These effects are also consistent with the aim of the scheme to remove traffic from local villages.

16.10.47 The A415 Abingdon Road to the west of Culham (link 35) is shown to have an increase in traffic of 88%, triggering a major adverse effect on accidents and safety. In the 2031 DN scenario the A415/Tollgate Road is very congested, and this restricts traffic flows through this part of the network. The scheme relieves congestion at this junction and allows traffic to flow more freely along the A415. Traffic flows on Tollgate Road (link 34) are reduced significantly and this reduces conflicts at this junction, reducing the potential for accidents. Therefore, whilst the apparent increase in traffic flows triggers an adverse impact, safety overall is expected to improve in this area.

16.10.48 As noted previously, the PIC data does not indicate any significant safety design issues, while the change in traffic flow is considered negligible and not resulting in a significant increase in turning movements within the scheme extents.

16.10.49 Therefore, operational traffic flows are predicted to have an overall moderate beneficial effect on accidents and safety on the local road network, which is significant.

Public Transport Users

16.10.50 As part of the HIF1 scheme, the following new bus stops are proposed:

- Six bus stops (three eastbound and three westbound) along the A4130;
- Four bus stops (two eastbound and two westbound) as part of the Didcot Science Bridge section;
- Four bus stops (a pair at the southern end inside the future employment site, and a pair near Appleford) as part of the River Crossing section; and
- Four bus stops (a pair at CSC and a pair north of Clifton Hampden Village) as part of the Clifton Hampden Bypass Scheme.

16.10.51 These additional bus stops will increase the accessibility and catchment of the existing bus services in this area, whilst also helping to cater for new or improved services in the future.

16.10.52 New bus services or a change in the existing frequency will not be introduced as part of the Scheme, however, the removal of traffic from local roads will improve journey times and reliability for bus services.

16.10.53 As part of the TA, journey time data has been extracted from the Paramics model for a number of routes, as shown in Figure 16.10.

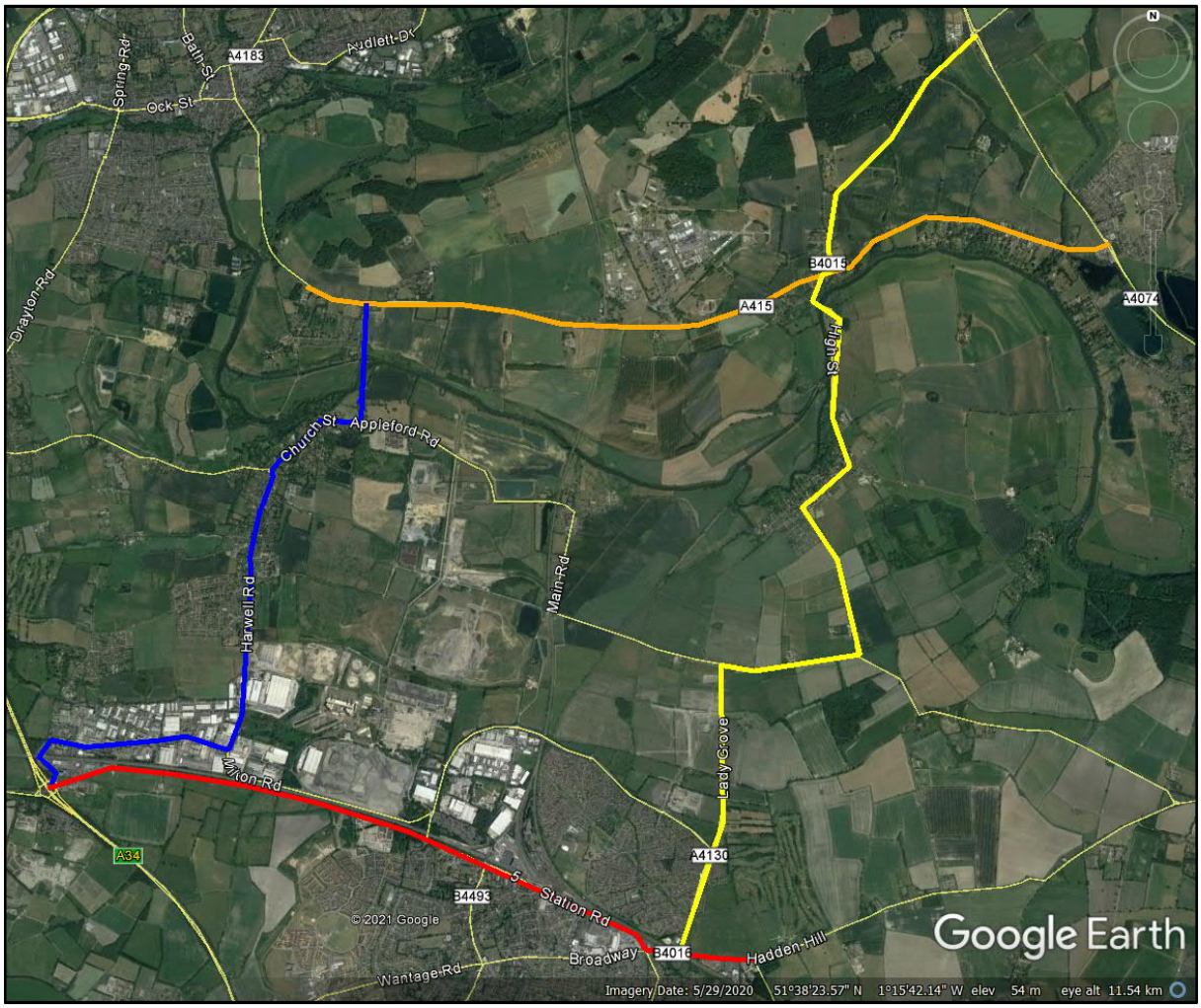

Figure 16.10: Journey Time Routes

16.10.54 The results indicate significant journey time reductions with the HIF1 scheme on the Didcot to A4074 route via Long Wittenham and Clifton Hampden (yellow route), Milton Interchange to Culham route via Sutton Courtenay (blue route) and Culham to Burcot route along A415 Abingdon Road (orange route), as traffic diverts off the local roads and uses the HIF1 scheme. The yellow and blue routes are used by bus services to cross the River Thames therefore the scheme enables lower journey times / improved journey time reliability for bus services using these routes.

16.10.55 A comparison of the sum of journey times for all routes is shown below.

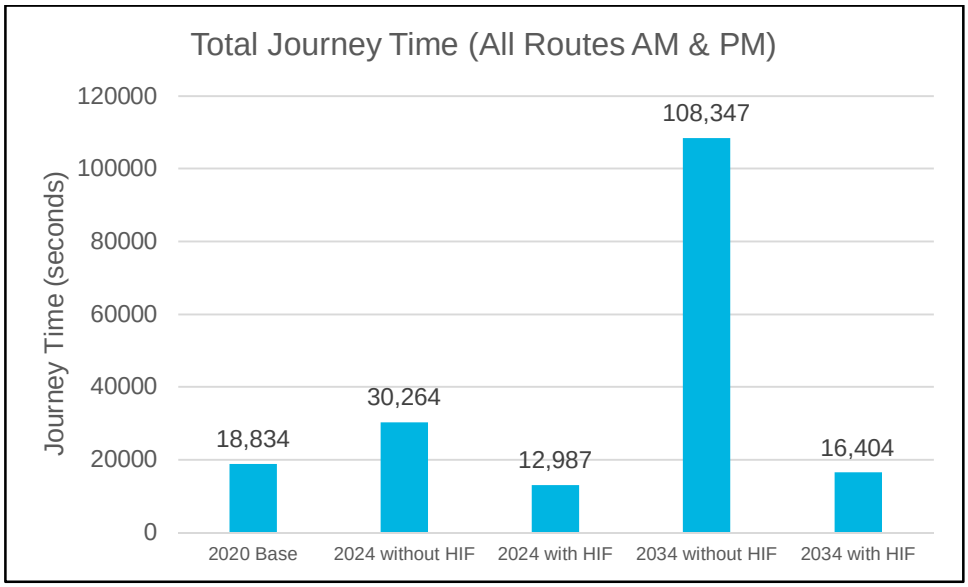

Figure 16.11: Journey Time Routes

16.10.56 The Figure above demonstrates that the total journey time for all routes is significantly reduced with the HIF1 scheme in both 2024 and 2034. The significant increase in journey times seen in 2034 without HIF is caused by increases across all routes, but predominantly the orange PM eastbound route. This is created by significant delays at the Clifton Hampden staggered signalised junction and CSC entrance.

16.10.57 Total journey times in 2034 with the HIF1 scheme are also slightly lower than those in 2020, showing that the HIF1 scheme helps to enable the planned growth whilst allowing the road network to operate similarly to the base scenario. Speeds across the entire modelled network help to illustrate this further, as presented in the following section. It is considered the overall effect during operation of the Scheme on public transport users is moderate beneficial and thus significant.

16.11 Monitoring

16.11.1 As no significant adverse effects have been identified in both the construction and operation assessments, no monitoring is proposed.

16.12 Summary

Construction

16.12.1 During the Scheme construction phase a total of 14 site access points will be used along the Scheme. This will help to disperse construction traffic around the local highway network. There is good access to the A34 and the wider strategic road network which will provide access for HGV traffic and help to minimise impacts on local roads.

16.12.2 Through the implementation of the CTMP construction traffic will be managed to minimise impacts on the local network, and overall, the construction phase is considered to have a negligible effect on driver delay, accidents and safety and public transport users, which is not significant.

Operation

16.12.3 The Scheme is forecast to reduce driver delay at several key existing junctions in the local area due to the re-routing of traffic to use the Scheme. It is therefore considered that the overall effect of the Scheme on driver delay is moderate beneficial, which is significant.

16.12.4 The Scheme is forecast to have an overall moderate beneficial effect on accidents and safety in 2034 with the operation of the Scheme.

16.12.5 Although the Scheme does not directly include changes to existing bus services, the reduction in delays on the network will improve journey times and reliability for bus services. The Scheme also creates opportunities for new bus routes in the future. Therefore, it is considered the overall effect of the Scheme on public transport users is moderate beneficial which is significant.

16.13 References

Ref 16.1 Didcot Garden Town HIF 1 Scheme - Transport Assessment' Transport Assessment, AECOM, (2021)

Ref 16.2 Ministry of Housing, Communities and Local Government (2021). 'National Planning Policy Framework', London.

Ref 16.3 Communities and Local Government, (2014). 'Planning Practice Guidance'. Available at: https://www.gov.uk/government/collections/planning-practice-guidance

Ref 16.4 South Oxfordshire District Council (2020). 'South Oxfordshire Local Plan 2011-2035'. Available at: https://www.southoxon.gov.uk/south-oxfordshire-district-council/planning-and-development/local-plan-and-planning-policies/local-plan-2035/adopted-local-plan-2035/

Ref 16.5 South Oxfordshire District Council (2019). 'South Oxfordshire Infrastructure Delivery Plan'. Available at: https://www.southoxon.gov.uk/wp-content/uploads/sites/2/2019/07/CSD06-Infrastructure-Delivery-Plan-January-2019-Update-LP.pdf

Ref 16.6 Vale of White Horse District Council (2016). 'Vale of White Horse Local Plan 2031 Part One: Strategic Sites and Policies'. Available at: https://www.whitehorsedc.gov.uk/vale-of-white-horse-district-council/planning-and-development/local-plan-and-planning-policies/local-plan-2031/

Ref 16.7 Vale of White Horse District Council (2019). 'Vale of White Horse Local Plan 2031 Part Two: Detailed Policies and Additional Sites'. Available at: https://www.whitehorsedc.gov.uk/vale-of-white-horse-district-council/planning-and-development/local-plan-and-planning-policies/local-plan-2031/

Ref 16.8 Vale of White Horse Local Plan 2031: Part 1 & 2, Infrastructure Delivery Plan (IDP)

Ref 16.9 Institute of Environmental Assessment, (1994). 'Guidelines for the Environmental Assessment of Road Traffic'. IEA, Horncastle

Ref 16.10 TAG Unit A4.1 Social Impact Appraisal (DfT, May 2020)

Ref 16.11 Highways England (August 2020), 'LA104 Environmental Assessment and Monitoring Revision 1'

SoR Reference: Para 5.12 - Chapter 10 Noise & Vibration

Table 10.5: Transient vibration guide values for cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mms^{-1} at 4Hz and above	
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mms^{-1} at 4Hz increasing to 20 mms^{-1} at 15Hz	20 mms^{-1} at 15Hz increasing to 50 mms^{-1} at 40Hz and above.
NOTE 1: Values referred to are at the base of the building. NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

10.4.16 BS 7385-2 states that for transient vibration, such as from individual impacts, the probability of building damage tends towards zero at levels less than 12.5 mms^{-1} PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

10.4.17 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 'Mechanical Vibration and Shock. Vibration of Fixed Structures. Guidelines for the Measurement of Vibrations and Evaluation of their Effects on Structures' (Ref 10.18) defines three different categories of building damage, namely:

- Cosmetic: formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick or concrete block constructions.
- Minor: formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick or blocks.
- Major: damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

10.4.18 BS 7385-2 states that minor damage occurs at a vibration level twice that of cosmetic damage, and that major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance has been used to define vibration criteria as detailed in Table 10.6 which can be used to assess continuous vibration impacts.

Table 10.6: Construction vibration criteria for assessing building damage

Damage risk	Continuous vibration level PPV mms^{-1}
Major	30
Minor	15
Cosmetic	6
Negligible	<6

Construction significance of effect

10.4.19 The key factors in identifying construction noise and vibration annoyance significant effects are the magnitude of the impact and the duration. The magnitude of the impact is considered on a scale from negligible to major, as detailed in Table 10.7, adapted from DMRB LA 1111.

SoR Reference: 5.12 - Chapter 6 Air Quality

Scheme opening year with (DS) and without (DM) the Scheme and the change in NO_2 concentration due to the Scheme in the opening year.

Table 6.15: Predicted annual mean NO_2 concentrations at existing selected public exposure receptors and change in concentration due to the operation of the Scheme

Area	Village	ID	2019 Base NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 DM NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 DS NO_2 ($\mu g/m^3$)	LTT_{E6} 2024 NO_2 Change ($\mu g/m^3$)
Clifton Hampden Bypass (CHB)	Burcot	R45	11.8	10.4	10.2	-0.2
	Berinsfield	R49	17.8	15.9	16.4	0.5
	Clifton Hampden	R38	24.8	22.4	14.6	-7.8
	Clifton Hampden	R56	12.9	11.3	13.1	1.9
	Little Baldon	R103	17.6	16.0	18.5	2.4
Culham to Didcot River Crossing (RIV)	Appleford	R75	14.2	12.7	16.0	3.3
	Long Wittenham	R32	12.9	12.0	10.7	-1.3
	Sutton Courtenay	R57	15.5	14.3	14.5	0.2
Didcot Science Bridge (DSB)	Didcot	R97	19.2	16.7	17.5	0.8
A4130 Widening (WID)	Milton	R4	17.8	16.3	15.7	-0.6

6.10.14 The Scheme is anticipated to result in both increases and decreases in annual mean NO_2 concentrations across the study area. Details of these results are provided in Appendix 6.2 with a summary below.

6.10.15 The largest decrease in NO_2 concentration is predicted at Clifton Hampden Pre-School (R38), located on the A415 in Clifton Hampton. A decrease of 7.8$\mu g/m^3$ with the Scheme operation is predicted at this receptor reducing the concentration from 22.46$\mu g/m^3$ to 14.6$\mu g/m^3$. This decrease is due to the Clifton Hampden Bypass which leads to a reduction in AADT on the A415 of around 8,600 from 11,000 to 2,400 vehicles per day.

6.10.16 The largest increase in annual mean NO_2 concentration is predicted at a residential property north of Hall Farm (R75). With the Scheme in operation, the annual mean NO_2 concentration predicted at this receptor in the Scheme opening year is 16.0$\mu g/m^3$, an increase of 3.3$\mu g/m^3$ from 12.7$\mu g/m^3$. This increase is due to the operation of the new river crossing adjacent to this property which is predicted to have an AADT flow of around 13,000 vehicles.

6.10.17 No receptors are predicted to experience an exceedance of the objective for annual mean NO_2 in the Scheme opening year. Therefore, a conclusion of no likely significant air quality effects for human health is recorded, in line with paragraph 2.90 of DMRB LA 105.

Designated ecological sites

6.10.18 Predicted NO_X concentrations and nitrogen deposition rates, and changes in NO_X concentrations and nitrogen deposition rates attributable to the Scheme in operation are presented in Appendix 6.2 for every ecological transect point modelled.

SoR Reference: 6.25 - Chapter 3 Assessment of Alternatives

Didcot Garden Town HIF 1 Scheme

Environmental Statement

Volume I

Chapter 3 – Assessment of Alternatives

September 2021

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3. Assessment of Alternatives

3.1 Introduction

3.1.1 This Environmental Statement (ES) chapter has been produced to report on the reasonable alternatives considered in relation to the Housing Infrastructure Fund (HIF 1) Scheme (hereafter referred to as the 'Scheme'), including a comparison of environmental effects. This chapter should be read in conjunction with Chapters 1, 2, 4 and 5 and Chapters 6 to 17 of this ES. Chapters 6 to 17 provide the assessment of environmental effects in relation to the Scheme and frame the comparison of environmental effects. Moreover, the Planning Application Supporting Statement (PASS) submitted with the planning application for the Scheme, and Chapters 1 & 2: Introduction and The Scheme respectively, of this ES, provide context in relation to the need for the Scheme.

3.1.2 The Environmental Impact Assessment (EIA) Regulations (Ref 3.1) (see ES Chapter 1: Introduction, for further details), state that an ES should provide a *"description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects"*.

3.1.3 In addition, the National Planning Practice Guidance (NPPG) (Ref 3.2) states that *"where alternative approaches to development have been considered, the Environmental Statement should include a description of the reasonable alternatives studied which are relevant to the proposed development and its specific characteristics and provide an indication of the main reasons for the choice made, including a comparison of the environmental effects"*.

3.1.4 The Design Manual for Roads and Bridges (DMRB) LA 104 Environmental Assessment and Monitoring (Ref 3.3) states that EIA must report on alternatives (as listed in paragraph 3.1.7) and that the *"level of effort applied to each of the alternative types should be proportionate to the feasibility of assessment and any benefits that assessment of an alternative can generate"*.

3.1.5 Therefore, and in line with the EIA Regulations, DMRB LA 104, and the NPPG, the reasonable alternatives studied by OCC (as the promoter) are reported in this chapter, along with an indication of the main reasons for the choices made, including a comparison of the environmental effects.

3.1.6 The preferred alignments for the four sections of the Scheme have been informed by detailed and multi-stage optioneering exercises. This includes the production of Options Assessment Reports (OAR) to identify appropriate interventions and subsequent public consultation, engineering, traffic modelling, and impact assessment work to identify the preferred alignments.

3.1.7 In accordance with DMRB LA 104, the following alternative types are reported in this chapter:

- Technology alternatives: temporary and permanent traffic control measures;
- Design alternatives: of physical elements of the Scheme, including alignments, structures, and landscaping;

- Size and scale alternatives: seeking opportunities to reduce the size and scale of the development where the Scheme objectives will not be compromised;
- Traffic demand alternatives: to meet the need through demand management techniques;
- Activity alternatives: such as the provision of traffic calming instead of new roads;
- Location alternatives: selection of different corridors or access routes; and as a sub-set of the main alternatives;
- Delivery alternatives: alternatives that reflect different means of delivering the desired end point in production terms (for example, a clear span bridge or one with piers and abutments in the river);
- Scheduling alternatives: programming the activities to avoid periods of enhanced environmental sensitivity e.g. consideration of alternative temporary land-take during construction;
- Input alternatives: use of different materials, lighting strategies or different designs;
- Mitigation alternatives: the variety of solutions available to mitigate the adverse consequences of a proposal; and
- The 'do minimum' and 'do nothing' scenarios.

3.1.8 The following feasibility and options reports have been produced by OCC and are referred to in this chapter:

- Didcot Science Bridge Scoping Report [not an EIA Scoping report] (July 2014) (Ref 3.4);
- Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept (2015) (Ref 3.5);
- Access to Science Vale: Options Assessment Report (Part 1, March 2018) (Ref 3.6);
- Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass Extended Feasibility Appraisal – Flood Study Report (May 2018) (Ref 3.7);
- Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass Extended Feasibility Appraisal – Landscape and Visual Appraisal (2018) (Ref 3.8);
- Didcot to Culham Link Road, Thames Crossing – Archaeological Desk-Based Assessment, Alignment 1 and 3 (April 2018) (Ref 3.9 and Ref 3.10);
- Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass – Built Heritage (May 2018) (Ref 3.11);
- Housing Infrastructure Fund 1 (HIF1) Outline Business Case: Environmental Assessment Report (November 2018) (Ref 3.12);
- HIF1 Outline Business Case: WebTAG Preliminary Environmental Impact Appraisal Report (December 2018) (Ref 3.13);
- Access to Science Vale: Options Assessment Report (Part 2, September 2019) (Ref 3.14);
- Didcot Garden Town HIF1: Options Assessment Report (AECOM, 2021) (Ref 3.15);
- Didcot to Culham River Crossing: River Thames Bridge and Approaches - Options Study (AECOM, 2021) (Ref 3.16); and

- Didcot to Culham River Crossing: Appleford Sidings Road Bridge, Options Study (AECOM, 2020) (Ref 3.17).

3.1.9 The following sections describe the different options that have been considered and why they have or have not been taken forward, and how environmental constraints or opportunities have influenced these decisions.

3.2 Optioneering

3.2.1 The Scheme has been subject to an options appraisal process to identify the best way to deliver the infrastructure for Didcot Garden Town in accordance with the set objectives (see ES Chapter 2: The Scheme, Section 2.1).

3.2.2 Optioneering was undertaken by OCC between 2014 and 2021, the results of which were presented in the studies outlined in paragraph 3.1.8. For clarity, Figure 3.1 illustrates the chronology of these studies, which are discussed in further detail in this section.

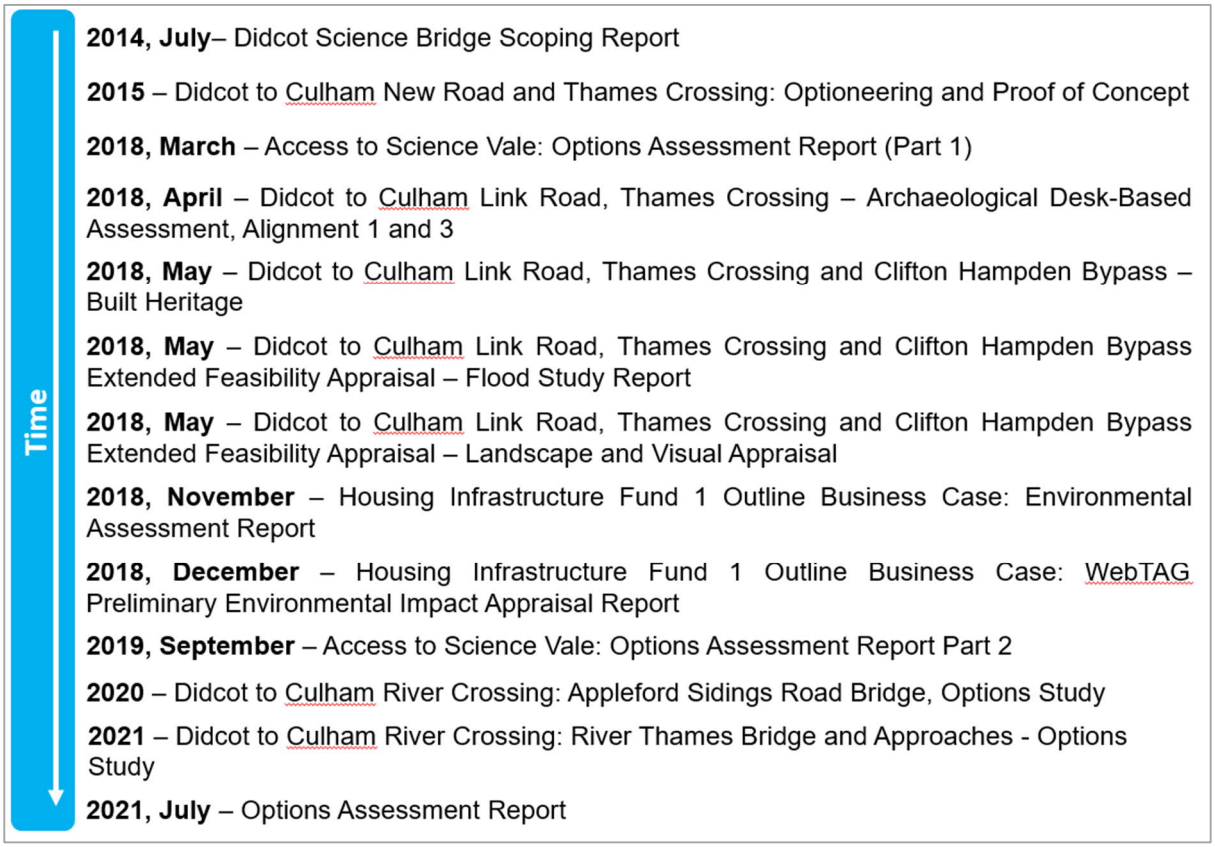

Figure 3.1: Chronology of optioneering reports

3.2.3 It was ascertained as early as 2014 by Vale of the White Horse District Council (VoWHDC) that new highway infrastructure will be required to provide additional highway capacity between Didcot and Culham, in order to facilitate planned housing and employment growth as a number of important routes for the area will operate above capacity with the additional associated traffic volumes (Ref 3.19). Moreover, similar conclusions were drawn by South Oxfordshire District Council (SODC) in 2017 (Ref 3.20), as it was also established that new highway infrastructure will be required to facilitate planned housing and employment growth. Consequently, options selection has generally been focused on either a new road connection across the River Thames or improvements to existing infrastructure that provides a link between

Didcot and Culham, as described in the Evaluation of Transport Impact reports produced by VoWHDC and SODC (Refs 3.19 and 3.20).

3.2.4 In order to clearly describe the optioneering that has taken place and the associated environmental constraints and/or opportunities, optioneering related to the Scheme as a whole and then each section of the Scheme extending from south to north (i.e. A4130 Widening, Didcot Science Bridge, Didcot to Culham River Crossing and Clifton Hampden Bypass), is described in turn under separate headings.

3.3 The Scheme as a whole

Delivery, activity, technology, traffic demand, do-minimum and do-nothing scenarios

Options Assessment Report Part 1 and Part 2

Access to Science Vale: Options Assessment Report Part 1

3.3.1 In 2018, OCC undertook an options assessment known as the Access to Science Vale: Options Assessment Report (Part 1, March 2018) (Ref 3.6). This looked at creating access to the Science Vale area (which comprises Didcot, including Milton Park and Didcot Power Station; Wantage and Grove; the Culham Science Centre (CSC); Harwell International Business Centre; and the areas between these locations). This option assessment focused on the wider transport issues in this area and the options to improve the situation, in the context with existing development and future aspirations for economic growth in the area.

3.3.2 This study had a strategic focus and rather than considering specific options for the alignment of the Scheme, it considered strategic transport options that could address the transportation need of the area now and into the future. These strategic transportation options included[1]:

- **Major road options:**

  MR1: Western approach

  – A4130 dualling – converting the existing single carriageway road to dual carriageway standard between Milton Gate and the proposed Valley Park Roundabout.

  – Didcot Science Bridge – a new road crossing of Great Western Railway by providing a new link road between the A4130 at the Southmead Industrial Park and proposed Valley Park Roundabout.

  MR2: Northern approach

  – Culham river crossing – a new link road connecting the A4130 at Ladygrove with A415 near CSC entrance including a new full standard river crossing. It should be noted that no specific alignment for this option was defined.

  – Clifton Hampden Bypass – upgrading of B4015 from A415 junction to A4074 at Golden Balls Roundabout including bypass of Clifton Hampden and online upgrading of northern section.

[1] Note the names of the Scheme's four sections have now changed and the names included here are as reported in the Options Assessment Report Part 1 2018.

- **Public transport options:**

  PT1: Bus improvements

  – Bus priority including bus lanes and bus priority at traffic signals on main roads within Didcot and on routes between Didcot and Harwell, Wantage, Milton, Abingdon and the A34.

  – Park & Ride in vicinity of the A34 to serve both journeys into Science Vale and as a remote P&R for journeys to Oxford.

  PT2: Rail improvements

  – Improved rail services from Didcot to Oxford and Reading (double existing service frequency).

  – Improved stations at Didcot and Culham plus a new station at Grove.

  PT3: Autonomous vehicles

  – Garden Line network to connect to Harwell, Culham, Abingdon, Milton Park, rest of Didcot.

- **Low cost options:**

  LC1: Traffic management

  – Junction realignments and signalisation.

  – Co-ordinated traffic signal control.

  LC2: Cycle and pedestrian facilities

  – Comprehensive cycle and walking networks within Didcot.

  – Links to other parts of Science Vale.

  – Cycle priority in town centre.

3.3.3 These options were analysed using the Department for Transport (DfT), Early Assessment and Sifting Tool (EAST), which is a decision support tool used to provide evidence on options in a clear and consistent format. It provides relevant, high level, information to inform decision making on how options perform and compare. The options were measured against 20 factors, one of which is the local environment: including environmental factors such as air quality, noise, landscape and visual and the water environment. Higher scores indicate a better performance.

3.3.4 The major road schemes (MR1 and MR2) and the rail improvements (PT2) scored the worst for impacts on the local environment given that their size and scale will have greater impact on the environment than other options. Bus improvements (PT1), autonomous vehicles (PT3) and traffic management (LC1) scored better due to the limited nature of the construction required, such that impacts on the local environment will be minimised. Cycle and pedestrian facilities (LC2) scored the best, as this proved to have the least impact on the environment. However, the report stated that *"it is unlikely that increased cycling and walking alone will be able to resolve the problems associated with connections from the town to the wider national transport network"*. Of the options assessed, the report concluded that only the major road schemes could address the transport issues and requirements of the area. Therefore, the report concluded that the following three options under MR1 and MR2 should be taken forward for further development:

- The dualling of A4130 and the Science Bridge;
- A new River Thames crossing and the Clifton Hampden Bypass; and
- A combination of both options.

Access to Science Vale: Options Assessment Report Part 2

3.3.5 In September 2019, OCC produced Part 2 of their Options Assessment Report (Access to Science Vale: Options Assessment Report, Part 2, 2019) (Ref 3.14). This took forward the recommendations of the Access to Science Vale: Option Assessment Report Part 1 and assessed the three options as detailed in paragraph 3.3.4. It also assessed improvements to walking and cycling infrastructure in isolation. Therefore, the options considered included:

- Do minimum (DM) – walking and cycling improvements;
- Do something 1 (DS1) – A4130 dualling (now the A4130 Widening) and Didcot Science Bridge;
- Do something 2 (DS2) – Culham to Didcot river crossing (now the Didcot to Culham River Crossing) and Clifton Hampden Bypass; and
- Do something 3 (DS3) – DM, DS1 and DS2 combined.

3.3.6 The options appraisal covered four overarching categories: i) strategic fit; ii) value for money; iii) financial case; and iv) delivery and commercial case. Environmental impacts where considered under the value for money category.

3.3.7 An environmental appraisal of these options was undertaken which focused on the following environmental factors:

- Air quality;
- Biodiversity;
- Greenhouse gases;
- Historic environment;
- Landscape;
- Noise;
- Townscape; and
- Water environment.

3.3.8 A seven-point scale was used, ranging from large adverse to large beneficial (with a neutral option), to assess potential environmental impacts associated with the various options. Due to the limited impact of the DM option, this was not assessed.

3.3.9 Generally, the three options will have adverse impacts on each environmental factor, with impacts on the water environment expected to be the greatest, with a score of large adverse across all options. The assessment determined that DS2 will deliver slight beneficial impacts, for greenhouse gases and noise. Overall, all options will have very similar environmental impacts.

3.3.10 It was concluded that option DS3 had the potential to fully deliver transportation benefits that align with the objectives of the Scheme and therefore, DS3 was chosen as the preferred option for delivering the objectives of the Scheme in accordance with the alignment shown in Figure 3.2.

3.3.11 It was determined that the do-nothing scenario is an unreasonable alternative, as the aspirations for the Science Vale and Didcot area will be unachievable without some form of transport interventions. The do-nothing scenario will have an adverse impact on the local, regional and national economy.

3.3.12 Additionally, OCCs Traffic Consultants have advised that due to the large number of developments in the area, traffic modelling, which is used in this ES to model air quality and noise impacts and undertake greenhouse gas (GHG) emission calculations, shows that the highway network in and around Didcot reaches gridlock before the future assessment year in 2039 under the do-nothing scenario. This could have environmental impacts, for example ES Chapter 15: Climate, shows that with the Scheme in place in the year 2034, GHG emissions are estimated to be approximately 1,074 tCO_{2e} lower than under the do-nothing scenario (referred to as the do-minimum in ES Chapter 15). Therefore, Chapter 15 shows that GHG emitted by road users, during the year 2034, will be higher under the do-nothing scenario. Furthermore, ES Chapter 6: Air Quality shows that during the opening year (2024), with the Scheme in place, there will be increases and decreases in nitrogen dioxide (NO_2) across the air quality study area, compared with the do-nothing scenario (referred to as the do-minimum in ES Chapter 6: Air Quality). No receptors are predicted to experience an exceedance of the objective for annual mean NO_2 in 2024, with the Scheme in place as compared with the do-nothing scenario. Moreover, ES Chapter 10: Noise and Vibration, shows that there will be increases and decreases in noise at sensitive receptors across the noise study area with the Scheme in place, compared with the do nothing scenario (referred to as the do minimum in ES Chapter 10: Noise and Vibration).

3.3.13 The result of the options appraisals (set out within the OAR Part 2, 2019) informed the development of further feasibility design options as described in the section below.

Environmental Assessment Report for the outline business case (November 2018)

3.3.14 In 2018, OCC produced an Environmental Assessment Report (Ref 3.12) to support the outline business case for the Didcot Garden Town HIF 1 Scheme. This was a desk-based appraisal providing information on the environmental sensitivity of the area, the constraints that the environment presents to the Scheme and the potential impacts the Scheme may have on the environment. Suggestions for mitigation measures were provided and further studies recommended. The Environmental Assessment Report focused on the following alignment options for the preferred option (DS3) (refer to Figure 3.2):

- Section A: Dualling of the A4130 from the A34 Milton Interchange to Didcot Science Bridge (similar to the A4130 Widening);
- Section B: A new road bridge over the Great Western railway in the vicinity of Didcot Power Station (Science Bridge) (similar to the Science Bridge);
- Section C: A new road crossing of the River Thames will be provided between Culham Science Centre and Didcot (similar to the Didcot to Culham River Crossing); and
- Section D: A bypass for Clifton Hampden (similar to the Clifton Hampden Bypass).

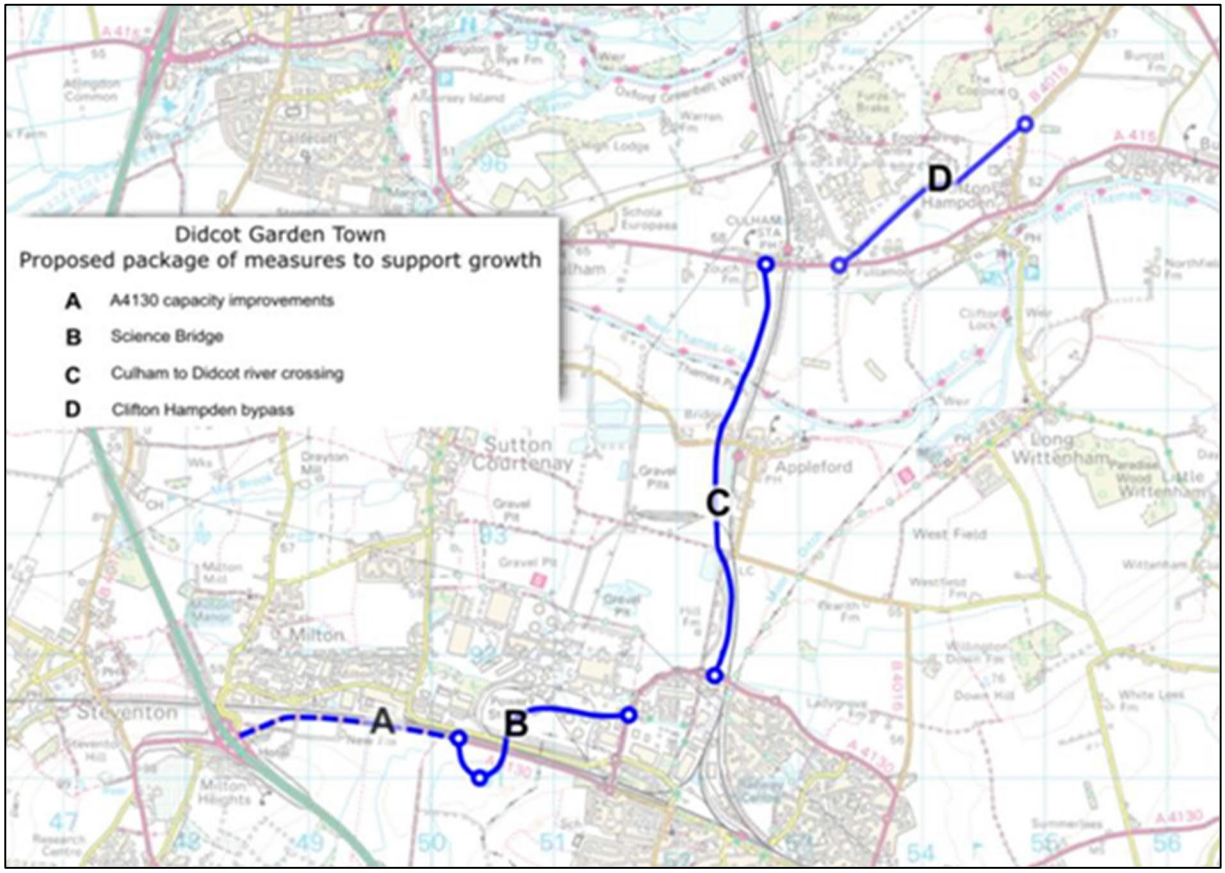

Figure 3.2: HIF 1 Scheme Map of Sections A - D, replicated from OCC's HIF 1 Outline Business Case: Environmental Assessment Report[2]

3.3.15 The report appraised these options against the following environmental disciplines:

- Landscape and visual impacts;
- Cultural heritage;
- Air quality;
- Noise and vibration;
- Biodiversity;
- The water environment; and
- Ground conditions and contaminated land.

3.3.16 The report also appraised the options in terms of town and country planning constraints, but this is not discussed in this section.

3.3.17 The report provided each environmental discipline with a RAG grading (Red/ Amber/ Green) in relation to their anticipated impact on the environment. Additionally, it was recommended that an EIA will be required to further assess the impacts of the Didcot Garden Town HIF 1 Scheme and that this process should inform its design. Early engagement with statutory consultees was also recommended. Table 3.1 below presents the summary of this study.

[2] Note: Option C(e) was not assessed by OCC's HIF 1 Outline Business Case: Environmental Assessment Report.

Table 3.1: Summary of the Housing Infrastructure Fund 1 Outline Business Case: Environmental Assessment Report (November 2018) (as replicated from section 11)

Discipline	Summary Comments	Red/ Amber/ Green Grading
Landscape	The main constraint in landscape terms is to avoid physical impact upon, and loss of, sensitive designations and features. This looks to be achievable for all Sections of the Scheme. Visual constraints include views from residential properties and designated landscapes such as the North Wessex Downs AONB and Registered Parks and Gardens.	Medium
Heritage	The Clifton Hampden Bypass (Section D) will have significant adverse impact on the setting of Scheduled Monuments, a registered park, and two conservation areas. The Culham to Didcot river crossing (Section C) [Didcot to Culham River Crossing] runs very closely adjacent to one Scheduled Monument.	Significant
Air Quality	Proposed route Sections will introduce either a new source of or change to road traffic emissions, potentially elevating local pollutant concentrations. The Scheme does not pass through any Air Quality Management Areas (AQMA) and there are not currently exceedances of the UK Air Quality Strategy objectives at locations of relevant exposure adjacent to the scheme.	Minor
Noise and Vibration	The Scheme has the potential to result in adverse noise effects at surrounding noise sensitive receivers due to increased road traffic noise levels, and a noise impact assessment should be undertaken. The Scheme may also result in beneficial impacts on the local road network where traffic flows are reduced as a result of the Scheme. Adverse vibration impacts are not considered likely at any identified existing receptors however, this will need to be confirmed once more information is obtained regarding potential new residential developments.	Medium
Ecology	Due to their proximity to the Site, Little Wittenham Special Area of Conservation (SAC) and Cothill Fen SAC may be affected by the Scheme. Protected species and Habitats of Principal Importance may be present on Site. These will need to be identified, retained where possible and relocated and or replaced (habitats) if required.	Medium
Water	All Sections cross areas with existing surface water flood risk. The Scheme will increase impermeable area and therefore runoff. This will require mitigation to prevent increasing surface water flood risk to surrounding receptors. All Sections will require a more detailed Level 2 Flood Risk Assessment (FRA) to provide a more detailed assessment of fluvial, surface water, groundwater and other flood risk sources.	Significant

Discipline	Summary Comments	Red/ Amber/ Green Grading
Ground Conditions & Contaminated Land	Potentially contaminative land uses identified including sewage works, power station, railway land, industrial sites and landfill. Section C includes area near landfill, which is seen as a significant risk.	Section A: Medium
		Section B: Medium
		Section C: Significant
		Section D: Medium

Environmental Impact Appraisal Report for the outline business case (December 2018)

3.3.18 OCC undertook a further environmental study in 2018 (Ref 3.13), which appraised the same options, but provided WebTAG and Appraisal Summary Tables (ASTs) in accordance with the DFT's, Transport Analysis Guidance Unit A3: Environmental Impact Appraisal. This reached a similar conclusion, that the options will have the greatest potential impacts on the water environment and cultural heritage assets. In addition, it was concluded that there could be some slight beneficial effects in relation to noise (related to the redistribution and rerouting of traffic) and greenhouse gases (related to a reduction in total kilometres travelled over a journey).

3.3.19 A summary of this reports findings is provided in Appendix 3.1.

Options Assessment Report 2021

3.3.20 Since the production of OARs Part 1 and Part 2 (2018 and 2019, respectively), the transport elements of the Scheme have continually been refined. Given OCC's objective to set out a robust and evidence-based audit trail for the preferred options and scheme designs, OCC commissioned AECOM to produce an updated OAR (Ref 3.15) reflecting the updated evidence base and options, including consideration of multi-modal options, which will replace the existing Part 1 and Part 2 OARs. Notwithstanding, the original OARs provide a wealth of information and are, therefore, still referenced.

3.3.21 The 2021 OAR assessed the following options, as shown in Table 3.2.

Table 3.2: Options Assessment Report 2021, Phase 1 options

Ref	Intervention	Mode	Source
0	Do Minimum	No additional Interventions	N/A
1	A4130 Widening	Multi-modal	Previously defined option (HIF)
2	Didcot Science Bridge	Multi-modal	Previously defined option (HIF)
3	Didcot to Culham River Crossing	Multi-modal	Previously defined option (HIF)
4	Clifton Hampden Bypass	Multi-modal	Previously defined option (HIF)

Ref	Intervention	Mode	Source
5	Enhanced bus network including bus lanes and bus priority signals	Public Transport	Previously defined option (OAR Part 1)
6	Park & Ride in vicinity of A34	Public Transport	Previously defined option (OAR Part 1)
7	Improved rail services from Didcot to Oxford and Reading	Public Transport	Previously defined option (OAR Part 1)
8	Improved stations at Didcot & Culham plus new station at Grove	Public Transport	Previously defined option (OAR Part 1)
9	Junction realignments and signalisation	Highways	Previously defined option (OAR Part 1)
10	Upgraded and co-ordinated traffic signal control	Highways	Previously defined option (OAR Part 1)
11	Comprehensive cycle and walking networks across Science Vale	Active Travel	Previously defined option (OAR Part 1; SVCN); New option
12	Science Vale Bus Rapid Transit	Public Transport	New option
13	Science Vale Light Rail Link	Public Transport	New option
14	Demand Responsive Transport	Public Transport	New option
15	Small scale bus improvements across Science Vale	Public Transport	New option
16	A34 Widening	Highways	Previously defined option (Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept (2016))

3.3.22 The above options were subject to a four phase sift process, with each successive phase assessing and refining options in greater detail. During the initial sifting phase, the options were scored against the Scheme's objectives and additional criteria (affordability, deliverability, acceptability, and feasibility). The five options with the highest scores were taken forward to Phase 2: EAST Appraisal - these were as follows: Option 1, Option 2, Option 3, Option 4 and Option 8 (as shown in the table above). Further information on the rationale for taking these options forward can be found in the OAR (AECOM, 2021).

3.3.23 Phase 2 demonstrated that of the five options assessed, only four options performed well against the five business case criteria laid out in the EAST tool (i.e. strategic case, economic case (environmental indicators are included in this criteria), management case, financial case and commercial case). This assessment identified the strengths and weaknesses of each option. As a result, option 8 was discounted at this stage and options 1-4 were taken forward for further assessment.

3.3.24 Phases 3 and 4 assessed the sub-options identified for options 1-4, all of which are covered elsewhere in this chapter. Sub-options include new alignments and major changes in design but does not include small incremental changes (e.g. those identified through value engineering). This assessment included consideration of the benefits and challenges of each of the sub-options, informed by more detailed assessment, such as environmental appraisals. Table 3.3 sets out these sub-options

and outlines where these sub-options are discussed within this chapter. As all these sub-options are discussed elsewhere, they have not been discussed again.

Table 3.3: Options Assessment Report 2021, Phase 3 Sub-Options

Ref	Option	Sub-Option	Source	Discussed in Chapter 3 at
Option 1: A4130 Widening				
1.1	A4130 Widening	Introducing higher capacity/quality pedestrian/cycle lanes	Optioneering Prior to 2018 (OCC)	Table 3.4
1.2	A4130 Widening	Roundabout at Great Western Park	Optioneering Prior to 2018 (OCC)	Table 3.4
1.3	A4130 Widening	Introducing bus only lanes	Optioneering Prior to 2018 (OCC)	Table 3.4
1.4	A4130 Widening	Dualling	Optioneering Prior to 2018 (OCC)	Table 3.4
1.5	A4130 Widening	Dualling – retain existing drainage ditch and associated vegetation	Post 2018 Consultation (OCC)	Section 3.4, paragraph 3.4.1
Option 2: Science Bridge				
2.1	Didcot Science Bridge	Alignment A (next to Manor Bridge)	Optioneering Prior to 2018 (OCC)	Table 3.5
2.2	Didcot Science Bridge	Roundabout at Great Western Park[3]	Optioneering Prior to 2018 (OCC)	Table 3.5
2.3	Didcot Science Bridge	Alignment B	Optioneering Prior to 2018 (OCC)	Table 3.5
Option 3: Didcot to Culham River Crossing				
3.1	Didcot to Culham River Crossing	Option 1	2016 Optioneering (OCC)	Section 3.6, paragraph 3.6.2 onwards
3.2	Didcot to Culham River Crossing	Option 2	2016 Optioneering (OCC)	Section 3.6, paragraph 3.6.2 onwards
3.3	Didcot to Culham River Crossing	Option 3	2016 Optioneering (OCC)	Section 3.6, paragraph 3.6.2 onwards
3.4	Didcot to Culham River Crossing	Option 4	2016 Optioneering (OCC)	Section 3.6, paragraph 3.6.2 onwards
3.5	Didcot to Culham River Crossing	Option 5	2016 Optioneering (OCC)	Section 3.6, paragraph 3.6.2 onwards
3.6	Didcot to Culham River Crossing	New Western Alignment	Post 2018 Consultation (OCC)	Section 3.6, paragraph 3.6.9 onwards

[3] Please note – Options 1.2 and 2.2 are the same

Ref	Option	Sub-Option	Source	Discussed in Chapter 3 at
Option 4: Clifton Hampden Bypass				
4.1	Clifton Hampden Bypass	Change signal timings	Optioneering Prior to 2018 (OCC)	Table 3.7
4.2	Clifton Hampden Bypass	Localised widening at the staggered junction	Optioneering Prior to 2018 (OCC)	Table 3.7
4.3	Clifton Hampden Bypass	Southern Bypass	Optioneering Prior to 2018 (OCC)	Table 3.7
4.4	Clifton Hampden Bypass	Northern Bypass – alignment closer to Clifton Hampden village	Post 2018 Consultation (OCC)	Section 3.7, paragraph 3.7.1
4.5	Clifton Hampden Bypass	Northern Bypass – roundabout at eastern end	Post 2018 Consultation (OCC)	Section 3.7, paragraph 3.7.2
4.6	Clifton Hampden Bypass	Northern Bypass – T-junction at eastern end of bypass	Post 2018 Consultation (OCC)	Section 3.7, paragraph 3.7.2

3.3.25 The OAR (AECOM, 2021) concluded that the preferred options are the alignment and options as outlined in ES Chapter 2: The Scheme. These options performed the best for numerous engineering, traffic and environmental reasons and crucially will provide enough capacity to enable development across Science Vale.

Public consultation on delivery, activity, technology, traffic demand alternatives

3.3.26 Following strategic optioneering and appraisals, OCC undertook a public consultation to understand public support for the possible scheme options in November 2018 (Ref 3.18). Options for i): A4130 Widening; ii) Didcot Science Bridge; iii) Didcot to Culham River Crossing and iv) Clifton Hampden Bypass were presented, including the pros and cons for each option. These are summarised in the tables 3.4 to 3.7.

Table 3.4: A4130 Widening

Options	Pros	Cons
Introducing higher capacity/quality pedestrian/cycle lanes	• Introduce improved pedestrian and cycle access • Improved modal choice • Links housing directly to employment	• Requires additional land • Does not provide additional capacity required • Does not offer improved bus journey times
Roundabout at Great Western Park (GWP)	• Slight widening at GWP	• Does not provide additional capacity required • Does not allow for future growth
Introducing bus only lanes	• Improved journey time reliability for bus passengers • Opportunity for improved pedestrian and cycle infrastructure • Improved modal choice • Links housing directly to employment	• Requires additional land • Will be same cost as dualling without the additional capacity benefits • Current bus service frequency may encourage abuse of bus lane by other motorists
Dualling (**preferred option**)	• Significant widening • Opportunity for improved pedestrian and cycle infrastructure	• Requires additional land

Options	Pros	Cons
	• Links housing directly to employment • Increased journey time reliability for bus passengers due to increased capacity	

Table 3.5: Didcot Science Bridge

Options	Pros	Cons
Alignment A (next to Manor Bridge)	• Introduce improved pedestrian and cycle access across at this location	• Expensive due to additional dualling and rail crossing • Does not provide additional road capacity • Does not help reduce congestion at GWP • Will require the demolition of properties • Difficult to deliver in engineering terms • Additional dualling will be required - causing further delay when constructing
Roundabout at GWP	• Slight road widening on the A4130 at GWP access	• Does not give additional road capacity • Does not allow for future planned growth
Alignment B	• Introduce improved pedestrian and cycle access across the bridge	• Expensive due to rail and road crossing required • Will tie-in on the south at GWP junction – not enough space to achieve this alignment • Will reduce the developable space of Didcot A development – potentially making it unviable
Alignment C (**preferred option**)	• Significant road widening • Reduction in congestion within the town centre and Station Road • Opportunity for improved pedestrian and cycle infrastructure • Links housing directly to employment • Opportunity for improved pedestrian and cycle • Much of land already secured through existing developments • Can predominantly be built off-line (away from the current road network) – reducing impact on current road network	• Expensive due to rail and road crossing required

Table 3.6: Didcot to Culham River Crossing

Options	Pros	Cons
Widening A34	• Slight road capacity improvement on A34 in Didcot the area	• Expensive as significant current structures need alteration • Highways England National Route (also European Route E05) – not appropriate to take significant amounts of localised traffic • Partly in Green Belt
Alignment 2	• Joins directly to the Clifton Hampden Bypass at Culham Science Centre • Provides additional road capacity to alleviate existing congestion issues	• Directly passes through a Scheduled Ancient Monument to the south of the River Thames • Passes close to the village of Appleford • Potential tie-in issues at the northern end with Culham Science Centre and Clifton Hampden bypass (may require significant land)
Alignment 3	• Provides additional road capacity to alleviate existing congestion issues • Joins directly to the Clifton Hampden Bypass at Culham Science Centre • Passes but does not directly affect any Scheduled Ancient Monuments	• Potential tie-in issues at the northern end with Culham Science Centre and Clifton Hampden bypass (may require significant land) • Partly in Green Belt • Requires widening of the B4016, Lady Grove
Alignment 4	• Provides additional road capacity to alleviate existing congestion issues	• Direct impact on Long Wittenham Conservation Area • Partly in Green Belt • Requires widening of the B4016, Lady Grove
Alignment 5	• Lowest costs as shortest length of new road	• Doesn't give required additional road capacity • Not an attractive alternative – too far for vehicles to divert • Partly in Green Belt
Alignment 1 (**preferred option**)	• Provides additional road capacity to alleviate existing congestion issues • Directly links employment sites at Culham and Enterprise Zones in Didcot	• Possible impact on the setting of a Scheduled Ancient Monument to north of the River Thames • Partly in Green Belt
Note: These options are discussed in more detail in Section 3.6 Didcot to Culham River Crossing and Figure 3.3.		

Table 3.7: Clifton Hampden Bypass

Options	Pros	Cons
Change signal timings	• Low cost	• Does not give additional road capacity • Could cause gridlock if traffic backs up on to Clifton Hampden Bridge

Options	Pros	Cons
Localised widening at the staggered junction	• Slight road widening	• Reduces pedestrian access • Will require additional land from residential gardens • Does not give additional road capacity required
Southern Bypass	• Slight road widening • Reduction in traffic through Clifton Hampden village • Opportunity for improved pedestrian and cycle infrastructure	• Expensive due to river crossing requirement • Not optimal Widening due to south flow not being the main flow • Increases traffic through Long Wittenham • Potentially within Green Belt • Additional noise for residents near the bypass route
Northern Bypass (**preferred option**)	• Significant road widening in the area • Reduction in traffic through Clifton Hampden village • Links to proposed Didcot to Culham River Crossing scheme to allow direct access to housing and employment • Helps facilitate planned growth in the area • Opportunity for improved pedestrian and cycle infrastructure	• Substantial land required • Built within Green Belt Additional noise for residents near the bypass route

3.3.27 In summary the preferred options for the i) A4130 Widening; ii) Science Bridge; iii) Didcot to Culham River Crossing; and iv) Clifton Hampden Bypass included:

- Dualling of the A4130 i.e. the current alignment of the proposed A4130 Widening;
- Alignment C i.e. the current alignment of the proposed Didcot Science Bridge;
- Alignment 1 i.e. similar to the current alignment of the proposed Didcot to Culham River Crossing; and
- Northern Bypass i.e. a proposed bypass located north of Clifton Hampden village.

3.3.28 A summary of the main topics raised during the public consultation is outlined below:

A4130 Capacity Improvements:

- Dualling should be extended further along the A4130; and
- Bus lanes should be included along the A4130.

Didcot Science Bridge:

- There should be connections into Milton Park.

Didcot to Culham River Crossing

- Impact of Alignment 1 on the village of Appleford needs consideration (this has been addressed, see section 3.6);
- Combined with the Clifton Hampden Bypass proposals, Alignment 1 will require two roundabouts on the A415;

- Alignment 3 and or 4 will link closely to Culham Science Centre (CSC) site and the proposed Clifton Hampden Scheme; and
- Consideration should be given to an alignment further west of Appleford using the existing haul roads (this was taken into consideration, see Section 3.6).

Clifton Hampden Bypass

- Clifton Hampden Bypass should be further north or designed to be further away from properties within the village (this was taken into consideration, see section 3.7).

3.3.29 These points have been incorporated within the Scheme design where feasible.

Input alternatives

3.3.30 The main construction materials for the Scheme are anticipated to be concrete, aggregate, asphalt, soils and steel.

3.3.31 Alternative materials will be considered during the detailed design stage. A commitment is made within the Outline Environmental Management Plan (OEMP) such that the Principal Contractor (PC) will explore alternative recycled or secondary sourced materials, and materials with a low lifecycle embedded carbon and water consumption.

Scheduling alternatives

3.3.32 Construction of the Scheme is anticipated to commence in 2023, subject to securing planning permission and compulsory purchase order (CPO) and will continue for approximately 18 months, ending in 2024 (see ES Chapter 2: The Scheme, for further details on construction). A detailed construction programme will be prepared by the appointed PC, therefore, information on scheduling alternatives is currently unavailable. It is anticipated that the general approach to construction and the timings for construction works will be influenced by the outcomes of the environmental assessment and mitigation requirements.

3.3.33 For the purposes of the EIA, a short construction programme is assumed to represent the worst case given that all construction activities will be undertaken over a short duration and thus there will be a greater intensity of construction activities (noting that such works will continue to be undertaken in accordance with defined working hours).

3.3.34 As is good practice, recommended mitigation outcomes from the environmental assessment will be presented in an OEMP (see Appendix 4.2) and incorporated into the CEMP and detailed construction programme.

Mitigation alternatives

Landscaping & Biodiversity

3.3.35 Landscaping included within the Scheme design (see ES Chapter 8: Landscape and Visual Effects and the Landscape and Biodiversity Management Plan) has been designed iteratively, utilising a multi-disciplinary approach with input from highway designers, ecologists, landscape architects, arboriculture and noise specialists. The overall approach has been to provide a design that integrates the Scheme into the landscape, whilst incorporating visual screening and replacement/ enhancement of habitats to mitigate the effects of the Scheme. The landscape design has been produced in consultation with OCC's landscape officer and other key stakeholders.

Subsequently, no discrete landscape planting alternatives are presented in the ES, but consideration has been given to:

- Native Woodland makes up a large proportion of planting throughout the Scheme. This will, once mature, visually screen views of the bypass and thereby, reduce the level of visual effects experienced by residents. It will also help to assimilate the Scheme into the landscape; and
- Extensive species rich grassland planting, with individual trees, will be provided to mitigate loss of ecological habitats and assimilate the Scheme into the landscape further resulting in green spaces and recreational opportunities.

Sustainable drainage solutions

3.3.36 New sustainable drainage solutions for drainage attenuation and ecological mitigation will be provided throughout the Scheme. The drainage design included as part of the Scheme, has been through an iterative design process and numerous solutions have been considered and discounted where they are not appropriate.

Flood Compensation

3.3.37 Areas for flood compensation will be provided as part of the Scheme to mitigate increases flood extent and levels and/or loss of flood plain. Various alternatives have been identified, modelled and agreed with the Environment Agency (EA) and the Lead Local Flood Authority (LLFA).

Noise mitigation

3.3.38 During the assessment of noise effects, different measures to mitigate noise effects have been considered, such as low noise surfacing, noise barriers and noise earth bunds. Through mitigation design iterations, and through agreement with OCC, a conclusion was reached that a combination of low noise surfacing and noise barriers will be most beneficial. Refer to ES Chapter 10: Noise and Vibration for further details.

3.4 A4130 Widening

Design alternatives

3.4.1 During the initial design stages of the Scheme design development, it was proposed to remove and level the existing ditch (currently located south of the A4130) containing hedgerows and trees and provide replacement hedgerows and trees along the southern boundary of the Scheme. However, in later design iterations it was decided that the existing ditch will be retained and enhanced, consequently, reducing the Scheme's impact on biodiversity loss while contributing to biodiversity net gain.

3.5 Didcot Science Bridge

Delivery and input alternatives

3.5.1 Consideration of alternative forms of construction and arrangement for the Didcot Science Bridge are quite limited. This is due to the arrangement of existing obstacles which it crosses; namely the A4130, the Great Western railway and Milton Road. The feasibility stage design featured a 3-span Science Bridge with a 37 m main span over the Great Western railway and approach spans both 32 m long over the A4130 and Milton Road. The engineering design development has managed to reduce the lengths of the approach spans to 30 m and 22 m respectively, reducing the construction cost of the bridge as well as the use of materials. A single-span or two-

span structure will be unfeasible because of the long span lengths that will be required and a structure with more than three spans will be uneconomical.

3.5.2 The proposed design features a steel and concrete composite bridge deck, formed of weathering steel girders with a cast in-situ concrete deck slab. Steel and concrete composite construction is typically the ideal solution for spans in the range of 20-50 m, both in terms of cost and span: depth ratio. Precast concrete beams can also present a cost-efficient solution for the required span lengths of the Science Bridge, but typically require a higher number of beam-lifting operations to construct; this is a significant disadvantage given the need for railway possessions to construct the bridge deck. Precast concrete bridge decks also require a greater overall construction depth than steel and concrete composite decks. With the current span and headroom clearance constraints, precast concrete deck construction is not preferred.

3.5.3 Weathering steel has been chosen for the main structural girders as this typically does not require maintenance painting during the working life of the structure. Avoiding the need to carry out painting works in-situ, at height is particularly advantageous from a safety perspective but this also reduces the overall disruption and delay to the travelling public which will be caused by carrying out bridge maintenance works.

Design alternatives

Alignment of the Didcot Science Bridge

3.5.4 The Didcot Science Bridge Scoping Report (July 2014) (Ref 3.4) sets out an options study for the alignment of Didcot Science Bridge, including Highway Option 1, 2 and 4 described as:

- Highway Option 1 – Construction of a right hand, super-elevated curve extending from the southern end of the bridge to connect to a new roundabout facilitating a tie in to the A4130.
- Highway Option 2 – The construction of a new junction on the A4130, to the west of the new bridge, plus a roundabout at the end of the bridge approach road.
- Highway Option 4 – Upgrading the existing A4130 to dual carriageway between Milton Interchange and Purchas Road roundabout. The development of all junctions within this stretch of the A4130 will be necessary to increase the capacity of the network to account for the increase in traffic flow.

3.5.5 Land take requirements were greater for Highway Option 1 compared to the other two options.

3.5.6 The report assessed the options against a number of different criteria, including buildability, traffic management, land take, cost, risk, programme implications, environmental considerations and flood risk. A summary table was provided at the end of the report, after the aforementioned criteria had been explored, with options (where applicable) given an impact rating ranging from low, medium, high and very high. The options study considered environmental impacts as related to ecology, air quality, cultural heritage, landscape, townscape and visual amenity, noise and vibration, materials and flood risk.

3.5.7 Figures 3.3 and 3.4 illustrate Highway Options 1 and 2. No figure is available for Highway Option 4.

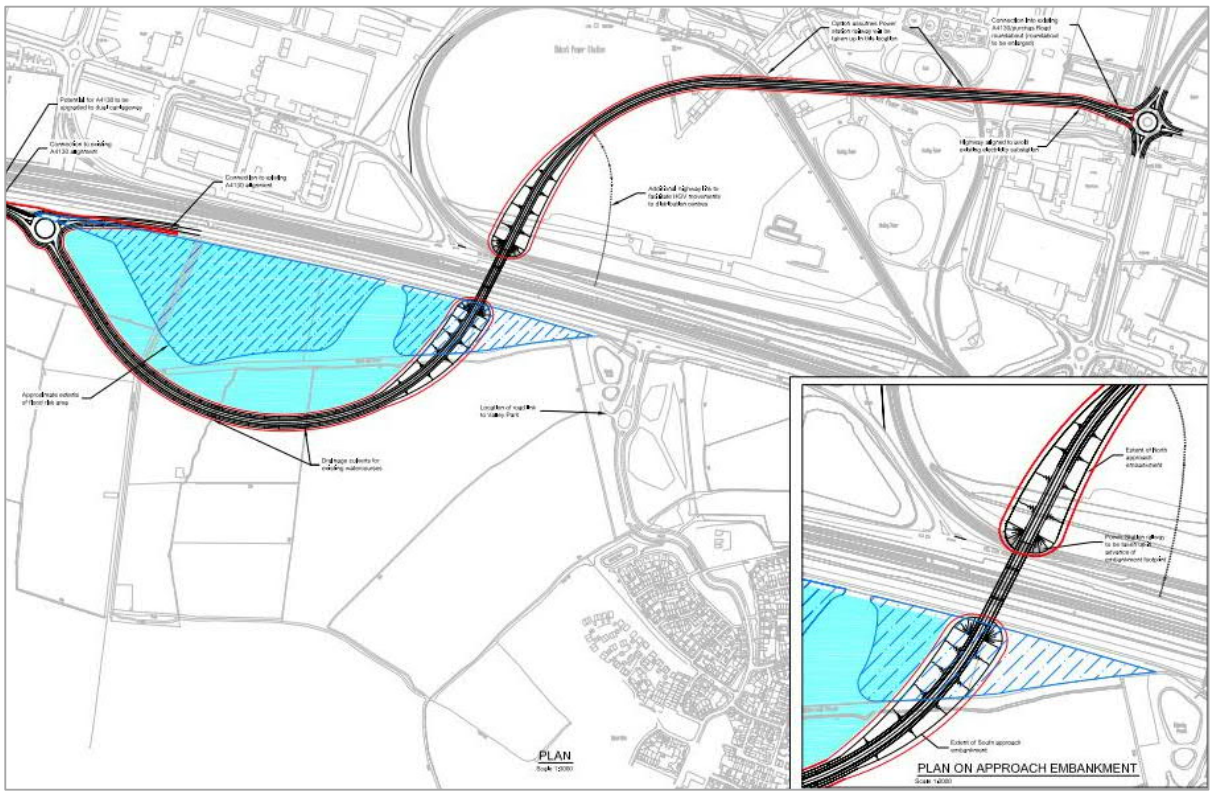

Figure 3.3: Highway Option 1

Figure 3.4: Highway Option 2

3.5.8 The options study identified the following potential environmental impacts:

- *"Potential for protected species to be located within the woodland and field margins within the scheme boundaries. As such it is recommended the area of land to be developed should be minimised to reduce environmental impact."*
- *"Flood zone 3 south of the A4130 alignment which will be impacted by the construction of a bridge and southern approach embankment. Construction in this flood zone must be reduced as far as practicable to prevent flooding encroaching on to the highway network… Highway construction in this area will negatively impact the volume of water capacity available and will result in flood waters being displaced.*"
- *"Highway Options 1 and 2 require localised construction of embankments within this flood zone. However, highway option 4 requires construction of a new carriageway to the south of the A4130, which will require much greater construction in the flood zone."*
- *"Both Highway Options 1 and 2 require construction of a northern approach embankment within the former power station grounds. The scoping study has identified risk of contaminated ground in this area and further ground investigation is required to confirm contaminates present. Subject to the outcome of this investigation ground remediation may be required."*

3.5.9 In addition, the report stated that *"a review of environmental impact for the bridge options has been undertaken using the Atkins Sustainability Toolkit. This has found bridge Option 2 scores marginally better than Option 1 as is considered to provide lower environmental impact"*. In the overall evaluation of options, Highway Options 1 and 2 were both given a medium score, whilst Highway Option 4 was given a high score as it was likely to create pinch points and increase congestion along the route. Highway Option 4 was scored high in relation to flood risk, as compared to a medium rating for Highways Options 1 and 2, as "*much of the dual carriageway construction along the east-west section of the A4130 will require construction within flood zone 3… this will result in a higher flood risk than Options 1 and 2"*.

3.5.10 The study concluded that *"Highway Options 1, 2 and 4 are considered to be feasible; however, Option 2 is recommended on the basis it provides greater benefits in terms of cost, land take and environmental impact"*. Therefore, Highway Option 2 was taken forward for further consideration and formed the basis of the Scheme design.

Tie-in with the A4130 north of Didcot

3.5.11 Owing to the presence of a National Grid 66kv Joint Bay, the alignment of the Didcot Science Bridge link road from the bridge to the A4130 has changed through the design process. Figure 3.5 shows that the Scheme, where it joins with the A4130, has moved southwards and the non-motorised user facilities are now separated from proposed carriageway to ensure that the Scheme avoids National Grid's utilities in this area. This change provides an opportunity to provide additional landscape planting, between the carriageway and the non-motorised user facilities, and is unlikely to have substantially more adverse or beneficial environmental impacts.

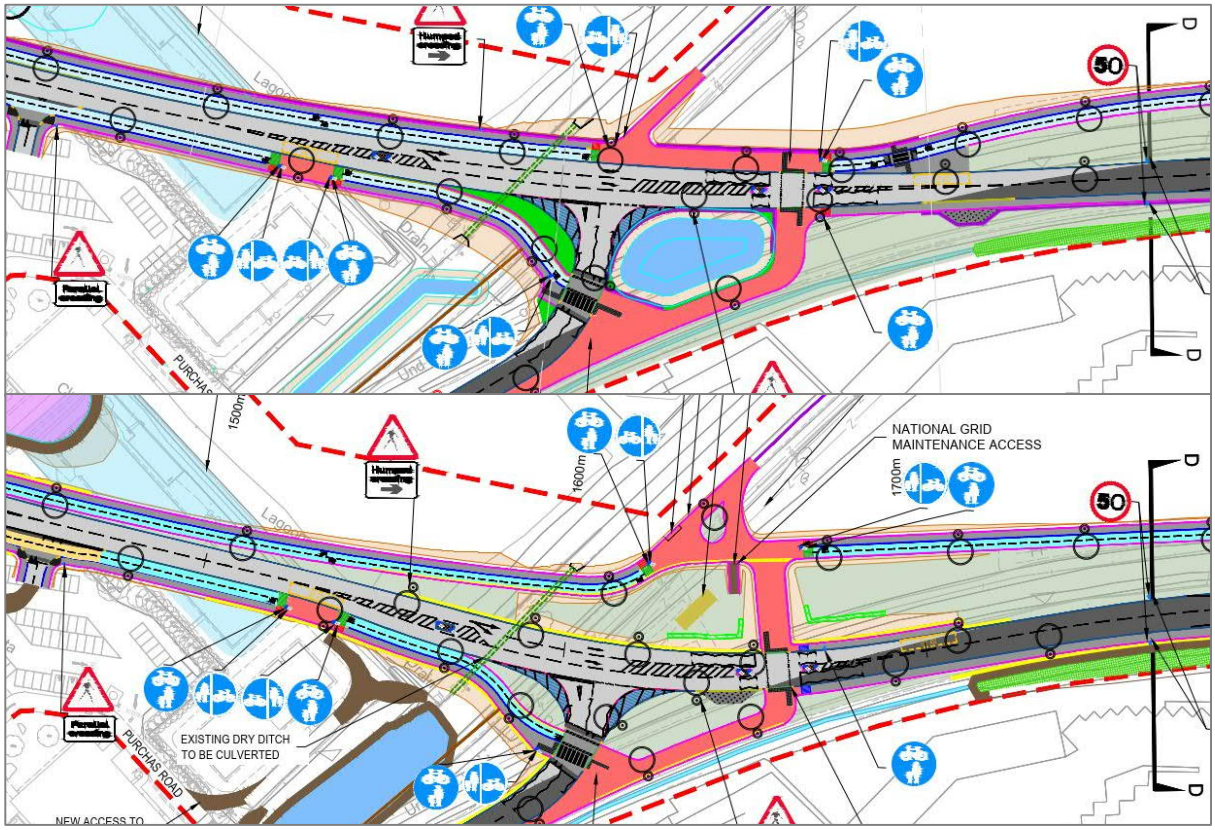

Figure 3.5: Changes to the Didcot Science Bridge link and tie-in with the A4130

3.6 Didcot to Culham River Crossing

3.6.1 The Didcot to Culham River Crossing has been subject to substantially more optioneering than other sections of the Scheme as the Site is less spatially constrained and, therefore, a number of alignments were available for consideration, and there are a number environmental and engineering considerations which are unique to this Scheme section, thereby requiring further appraisal. These optioneering and design iterations are discussed below.

Design, size and scale and location alternatives

Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept (2015)

3.6.2 In 2015, optioneering was undertaken by OCC to ascertain the best alignment for a new road and bridge over the River Thames, linking Didcot to Culham Science Centre. The options are described below and illustrated in Figure 3.6:

- **Option 1:** Most westerly option and is the only option west of the railway. It utilises a small stretch of the existing A415 to connect to the Clifton Hampden Bypass before heading south from the A415 via a proposed roundabout. The option crosses the River Thames via a new bridge before meeting the B4016 to the west of Appleford via another proposed roundabout. The alignment continues south passing over the Appleford Sidings rail tracks via a new bridge and then continues south to join the A4130. This route is adjacent to the Cherwell Valley railway line, and travels through historic mineral extraction and landfill sites for a large section.
- **Option 2:** From the north this option ties directly into the proposed roundabout of Clifton Hampden Bypass. The alignment heads south from the A415 crossing the River Thames via a new bridge. The alignment continues to head south-west

before crossing the B4016 and railway via a new bridge, where it then heads south to the west of the railway and ties into the A4130 via a roundabout.

- **Option 3:** From the north this option ties directly into the proposed roundabout of Clifton Hampden Bypass. The alignment heads south from the A415 crossing the River Thames via a new bridge. The alignment continues to head south-east before meeting the B4016 where a roundabout will be provided. The alignment continues south on the line of the existing B4016 and joins a proposed roundabout with the Didcot Northern Perimeter Road.
- **Option 4:** The most easterly option of those in the Didcot to Culham River crossing, from the north it heads south from the A415 crossing the River Thames, twice (via two new bridges), before passing the western fringe of Long Wittenham and joining with the B4016 via a proposed roundabout. The alignment continues south on the line of the existing B4016 where it will join with the proposed Didcot Northern Perimeter Road.
- **Option 5:** the most easterly of all options, it links the A4130 near Brightwell-cum-Sotwell and the A4074 Shillingford. From the A4074 the option heads south and crosses the River Thames via a new bridge. The option continues south until joining with the existing A4130.
- **Option 6:** this option requires the widening of the A34, which is operated and maintained by Highways England, in both directions for 13.5 km from Milton Interchange to Hinksey Hill Interchange (not shown in Figure 3.6).

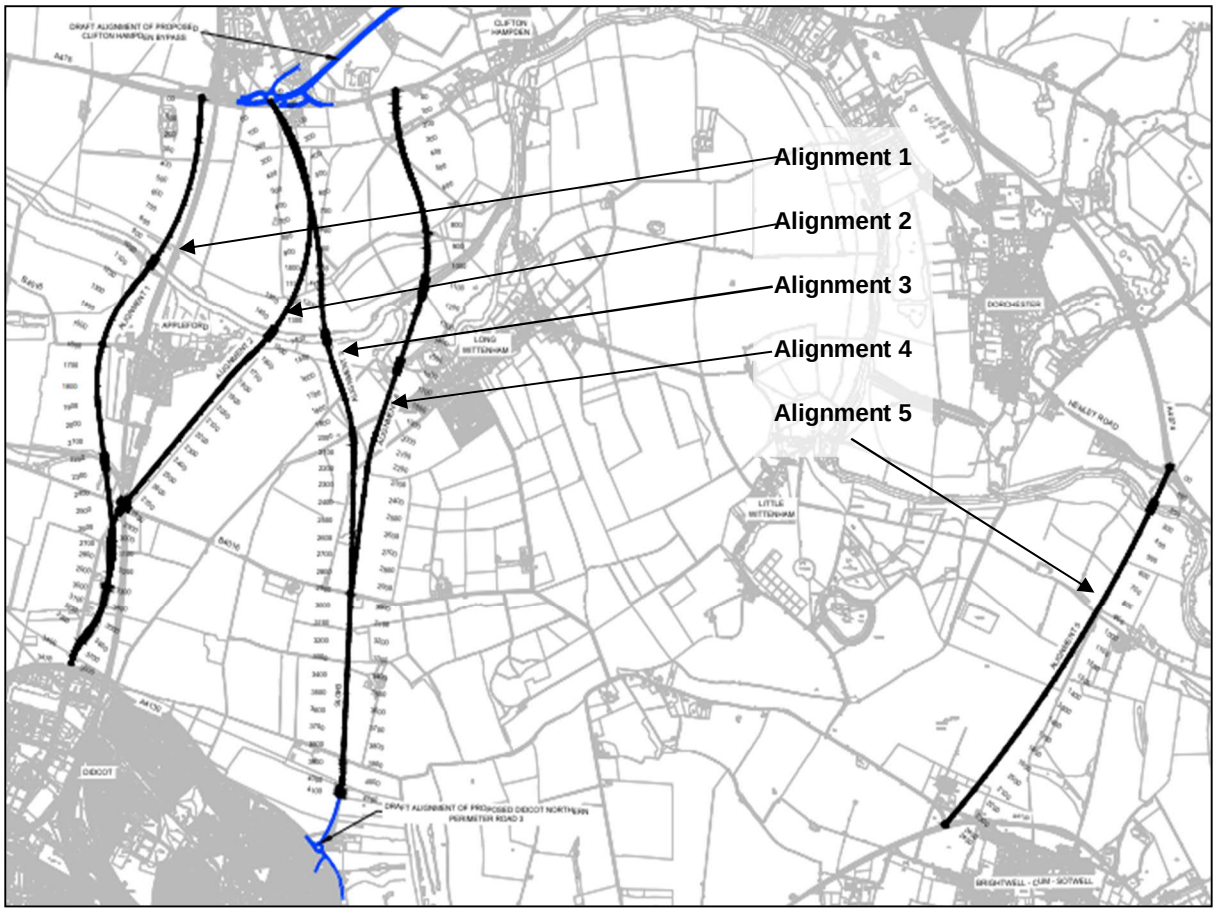

Figure 3.6: Initial options from 2015 (Option 6 is not shown)

3.6.3 These options were subject to the EAST (a decision support tool used to provide evidence on options in a clear and consistent format. It provides high level, information to inform decision making). Option 6 was not subject to the EAST analysis as it was beyond the scope of the assessment at the time.

3.6.4 As part of the EAST analysis, each of the options were given a score against numerous engineering, economic and environmental considerations; higher scores indicate better performance. In engineering terms, option 1 scored the most highly as it provided the best balance between scheme performance and deliverability. Option 3 was given a similar score but scored slightly lower in terms of performance and deliverability. Option 2 scored highly in relation to scheme performance but very poorly regarding deliverability and was placed third in terms of overall score.

3.6.5 Option 1 and 2 scored the highest in terms of the economic case, and option 3 scored only marginally lower. Option 4 scored marginally lower than option 3, but option 5 scored the lowest of all the options.

3.6.6 The environmental scores for the options are shown on Table 3.8, which have been taken from Appendix H of the Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept report (2015). In addition, a Red, Amber, Green (RAG) rating was given to each of the environmental aspects considered by the study. A Green rating indicates that there are few environmental constraints, and that they could be mitigated using established mitigation methods, whilst a Red rating indicates that the option is likely to have highly adverse impacts on the environment, to which mitigation may not be available or is unlikely to avoid or reduce the impact. These ratings are also indicated in Table 3.8.

Table 3.8: Environmental scoring and RAG ratings, as shown in Appendix H of the Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept report (2015)

	Option*				
	Option 1	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Scoring	23	22	24	23	18
Air quality	Green	Green	Green	Green	Green
Noise	Amber	Amber	Amber	Amber	Amber
Landscape and visual	Amber	Amber	Amber	Amber	Red
Heritage	Red	Red	Red	Red	Red
Ecology	Amber	Amber	Green	Green	Amber
Water	Amber	Amber	Amber	Amber	Amber
Planning**	Amber	Green	Green	Green	Amber
Land quality; geology, soils & contaminated land	Amber	Amber	Amber	Amber	Red

* Option 6 was not given a RAG rating or an environmental score, as the analysis of environmental impacts were beyond the scope of the 2015 study.

** Planning is not an environmental factor, but this category has been included here for completeness, as this category was included in the 2015 study.

3.6.7 In environmental terms, options 1 to 4 were recommended to be taken forward given the limited difference between the scores given to these options, however options 3 and 4 where considered to have the least environmental impacts with mostly Green RAG ratings. A summary of likely environmental impacts is presented in Table 3.9.

Table 3.9: Summary of likely environmental impacts, as shown in Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept report (2015)

Environmental discipline	Summary of likely environmental impacts*
Air Quality	"All options score equally in this category at this level of analysis. There are no Air Quality Management Areas or designated ecological sites within 200 m of any of the options."
Noise	"Both Options 1 and 3 score the best in this category. Option 1 is west of the railway line which combined with the B4016 are the existing noise sources. The indicative Design Manual for Roads and Bridges (DMRB) *[note the DRMB has since been updated]* 1 km study area includes the whole of Appleford, however the proposed scheme is will divert traffic from passing through Long Wittenham which will have a positive effect on the noise reduction. Option 3 passes between the villages of Appleford and Long Wittenham which is favourable when compared to Option 2 and 4 however the 1 km DMRB study area still includes both villages."
Landscape and Visual	"Option 1 scored the best in this category. This is because the proposed alignment follows the line of the existing railway line which limits the visual impact on properties in Appleford due to the existing associated planting. The alignment also passes through an area of historical landfill west of Appleford which will avoid new landscape impacts. Option 5 is the worst of the competing options in this category. This is because the area is within the North Wessex Downs Area of Outstanding Natural Beauty (AONB) and has a significant impact to the Thames Valley landscape."
Heritage	"All competing options score equally in this category. Option 1 has an impact on the setting of a Scheduled Ancient Monument north of the river Thames, Option 2 directly passes through a Scheduled Ancient Monument to the south of the river Thames and has an impact on the setting of the Round Borrow Cemetery to the north of the river Thames, Option 3 affects the setting of both the Round Borrow Cemetery to the north of the river Thames and the Scheduled Ancient Monument to the south and also has impacts the setting of the Long Wittenham Conservation Area. Option 4 has a direct impact on the setting of Long Wittenham Conservation Area. Option 4 has a direct impact on the setting of Brightwell Barrow, Sinodun Hill Camp, and Dike Hills scheduled monument south of the Thames, and ring ditches and enclosure scheduled monument north of river."
Ecology	"Options 3 and 4 score the highest in this category as they impact the surrounding ecology the least when compared to other options. Notable constraints to both options include a traditional orchard BAP habitat and deciduous woodland BAP habitat within 1 km of the proposed alignments. Option 1, 2 and 5 all score the lowest in this category. Option 1 and 2's score is lowered by the fact there are 13 ponds are within 500 m of the proposed alignment and that it crosses suitable terrestrial habitat for Great Crested Newts. Option 3's score is lowered because the proposed alignment is 790 m east if Little Wittenham Wood SSSI/SAC which is designated for its Great Crested Newt population, furthermore there are five Ancient Woodlands within 2 km of the proposed alignment, with the closest being 340 m away."
Water	"Options 1 and 2 score the highest in this category as their impact to the surrounding Water Framework Directive feature is lower than competing options. Options 3, 4 and 5 all score the lowest in this category. Option 3 is within an area which has two groundwater abstraction within 1 km of the scheme, which is underlain by a secondary A superficial aquifer. Option 4 requires crossing the river Thames close to a complex meander which may have Water Framework Directive compliance issues. Option 5 is underlain by a Principle Bedrock Aquifer and pockets of Secondary A superficial aquifers, furthermore the option is also within an area at risk of the Wilstone and Radley Ash Lake G reservoirs flooding."

Environmental discipline	Summary of likely environmental impacts*
Geology, soils and contaminated land	"Options 1 – 4 score equally and highest in this category. Option 1 runs alongside the railway throughout and passes the boundary of a historical landfill south of the river Thames and another south of the B4016 which are known to have accepted liquid and waste sludge from 1977 – 1983 and until 1976 respectively. Furthermore Option 1 passes close to an auto services business which has a single record of a 'significant pollution incident' which is noted as a possible source of contamination. Option 2 also passes both the historic landfill south of the B4016 and the auto service business. Option 3 passes directly through a historical landfill north of the existing B4016/Sires Hill junction, records indicate that this landfill accepted inert, commercial, industrial, household and liquids / sludge waste from 1945-1973. However, no other potential contamination sources were identified along the route. The start of Option 4 is located close to a petrol station and sewerage works (potential sources of contamination). Like Option 3, the route passes through a historical landfill north of the existing B4016/Sires Hill junction. The route also briefly passes close to a conservation area in proximity to the River Thames Option 5 is the lowest scoring option in this category. This is driven by the option being in a region of outstanding natural beauty (North Wessex Downs). Furthermore, the land to the southern extent comprise no superficial geology and bedrock of chalk, sandstone or siltstone all of which are a Principal Aquifer which is highly sensitive and the agricultural land required for option is graded 1-3 ranging from good to excellent. This option will almost certainly have a negative effect on land quality."
Planning	"Options 3 and 4 scored the highest in this category, this is because both options improve connectivity to strategic employment and housing sites which have been identified in local plans. Options 1 and 5 scored the lowest in this category. Option 1 scored less than competing options because there are possible planning constraints with respect to mineral extraction and landfill restoration, furthermore the Appleford Sidings is safeguarded as a permanent aggregate depot and is used for importation of waste, which will require significant negations to span with a proposed structure. Option 5 provides limited connectivity between strategic development sites and has an adverse impact on the North Wessex Downs Area of Outstanding Natural Beauty."
* This assessment was considered correct at the time of writing however, it may be superseded by this ES as the result of detailed desk and site surveys, and computer modelling.	

3.6.8 Overall, the EAST analysis favoured Option 1. However, both Options 1 and 3 were taken forward for further analysis. This analysis found that both options will provide similar benefits in terms of engineering, environment and strategic economics, however, Option 1 was considered to be marginally ahead in terms of its ability to meet the strategic objectives for the Scheme, although it was considered likely to be the most expensive of the two options. On the basis that option 1 will better meet the strategic objectives for the Scheme, Option 3 was discounted. Option 1 (i.e. an alignment west of the Didcot to Culham railway line) was selected as the preferred option.

Extended Feasibility, Flood Study, Landscape and Visual Appraisal and Archaeology reports 2018

3.6.9 An extended feasibility study was completed in 2018 - relevant environmental reports that compared impacts of the options include:

- Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass Extended Feasibility Appraisal – Flood Study Report (May 2018) (Ref 3.7);

- Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass Extended Feasibility Appraisal – Landscape and Visual Appraisal (2018) (Ref 3.8);
- Didcot to Culham Link Road, Thames Crossing – Archaeological Desk-Based Assessment, Alignment 1 and 3 (April 2018) (Ref 3.9 and Ref 3.10; and
- Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass – Built Heritage (May 2018) (Ref 3.11).

3.6.10 These reports analysed the environmental impact of two alignments, namely Alignment 1 and Alignment 3 as illustrated in Figure 3.7. These alignments are similar to options 1 and 3 considered in the earlier Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept (2015) (Ref 3.5), which is discussed above in this sub-section (see paragraph 3.6.2).

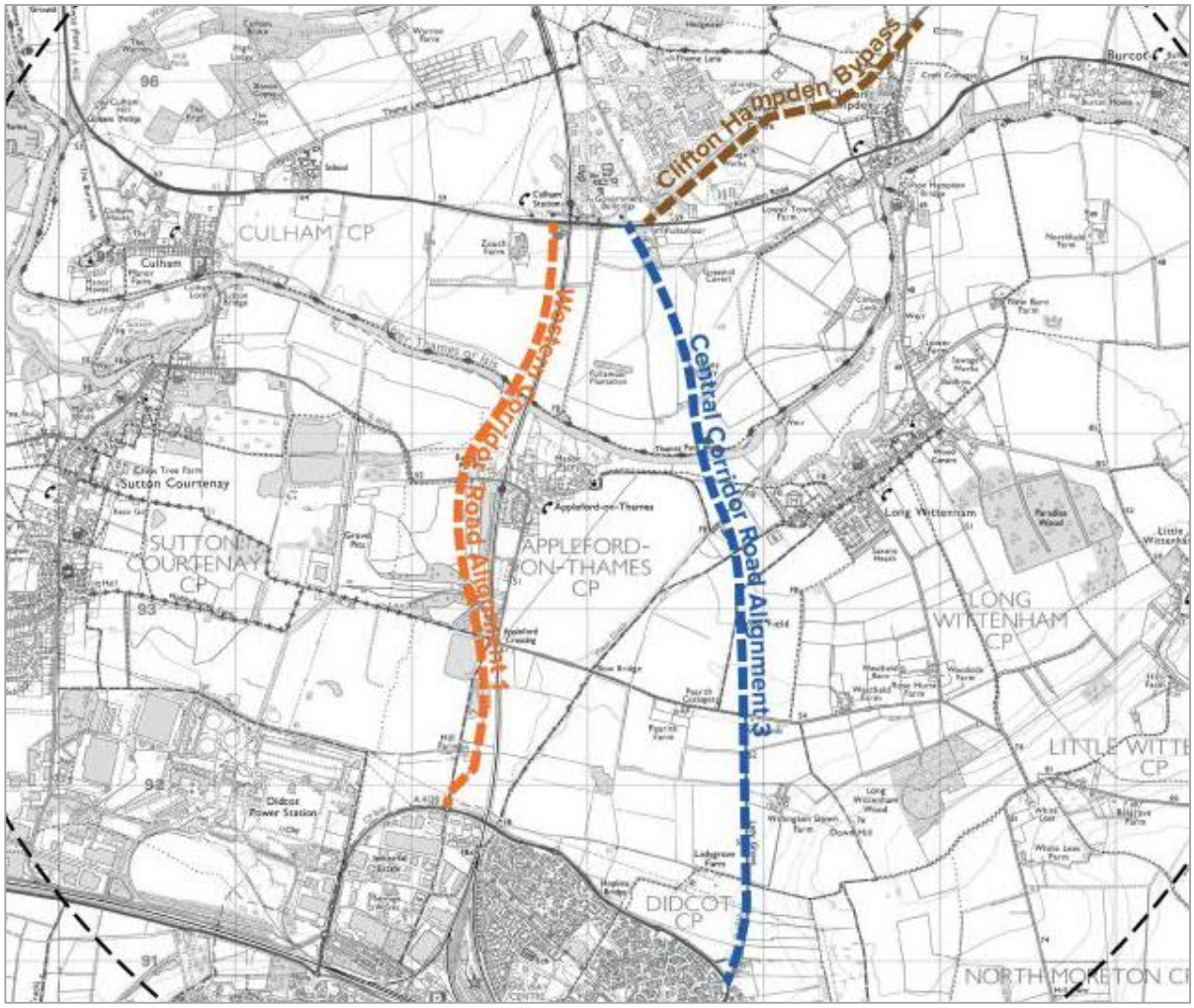

Figure 3.7: Extended Feasibility reports (2018), Alignments 1 and 3

3.6.11 The Flood Study Report (Ref 3.7) found that there was *"no insurmountable constraints to either crossing options in terms of drainage strategy that will prevent delivery of either road alignment"*. At the time, it was considered that Alignment 1 will require slightly less flood water attenuation (2,066 m^3) compared to Alignment 3 (2,264 m^3).

3.6.12 The Landscape and Visual Appraisal (Ref 3.8) concluded that the landscape surrounding Alignment 3 is in a better condition and, therefore, is more sensitive to development, potentially leading to greater impacts on the landscape. In addition, the

report concluded that *"the visual baseline affected by Alignment 3 is generally more rural and open in character than that of Alignment 1 and is therefore more sensitive and the visual effect is less contained and will require greater remediation/ protection"*.

3.6.13 The Archaeological Reports (Ref 3.9 and Ref 3.10) concluded that both alignment options will be located within 500 m of two Scheduled Monuments (SM), with a third being located within 1 km of the options. Alignment 1 will be located immediately east of one SM (NHLE 1006345), but will not directly impact it. Alignment 3 will be located immediately east of two SMs (NHLE 1421606 and NHLE 1004849) but will not directly impact them. It was considered that both alignments will have a degree of harm on these assets, but that this was likely to be less than substantial, and on the lower end of the harm scale. One difference between the two alignments was that Alignment 1 was located in an area that has been subject to wide-spread mineral extraction which means *"that a significant proportion of the proposed route is archaeologically sterile"* which thus reduces the likelihood of finding any unknown archaeological assets.

3.6.14 The Built Heritage Report (Ref 3.11) identifies that Alignment 1 will extend in close proximity to the Grade II listed Culham Station Overbridge; Grade II* listed and Culham Station Ticket Office and Waiting Room; the non-designated heritage asset Zouch Farm; Grade II listed Road Bridge over the Railway; and listed buildings within Appleford. Although Alignment 1 will extend in close proximity to these assets, the report concludes that there was *"unlikely to be any harmful effects of Alignment 1 on listed buildings, conservation areas or locally listed buildings"*.

3.6.15 Alignment 3 was likely to require the demolition of the Grade II listed Fullamoor Farmhouse, which will constitute 'substantial harm'. However, it was considered likely that the alignment could be amended to avoid this asset but, depending on the re-alignment, there was *"still likely to be some degree of harm to the setting and appreciation of the significance of Fullamoor Farmhouse, but this will be less than substantial and outweighed by the public benefits of the new link road"*. It was also thought that this alignment could have an impact on the setting and appreciation of listed buildings within Appleford and the Grade II listed Lady Grove Farmhouse and Willingdon Down Farmhouse. However, it was concluded that this was *"not likely to materially harm the significance or appreciation of the significance of the listed buildings*". The report concluded that *"Alignment 1 is preferable to Alignment 3 of the Culham Link Road, because it involves no harmful built heritage impacts"* but it was noted that Alignment 3 could be realigned to reduce the harm to Fullamoor Farmhouse.

Design and activity alternatives

Alignment of the Didcot to Culham River Crossing

3.6.16 The preferred alignment of the Didcot to Culham River Crossing, which was taken forward as a result of the optioneering described above, was amended following stakeholder engagement, traffic modelling, and archaeological assessments as described below. During the November 2018 public consultation, OCC received comments from Appleford Parish Council (APC) and Appleford residents that the alignment was too close to the village and should be moved westwards. Updated traffic modelling showed that a larger distance between the proposed A415 Abingdon Road roundabout and proposed Clifton Hampden roundabout operated better in future years. Historic England preferred a more western alignment as it was further from the 'Settlement site N of Thames' Scheduled Monument. The once preferred option (black layout) and the 'new western alignment' (pink layout[4]), which is included in the Scheme design (with some changes), are shown in Figure 3.8.

[4] Note: the pink alignment is now also superseded – see paragraph 3.6.20.

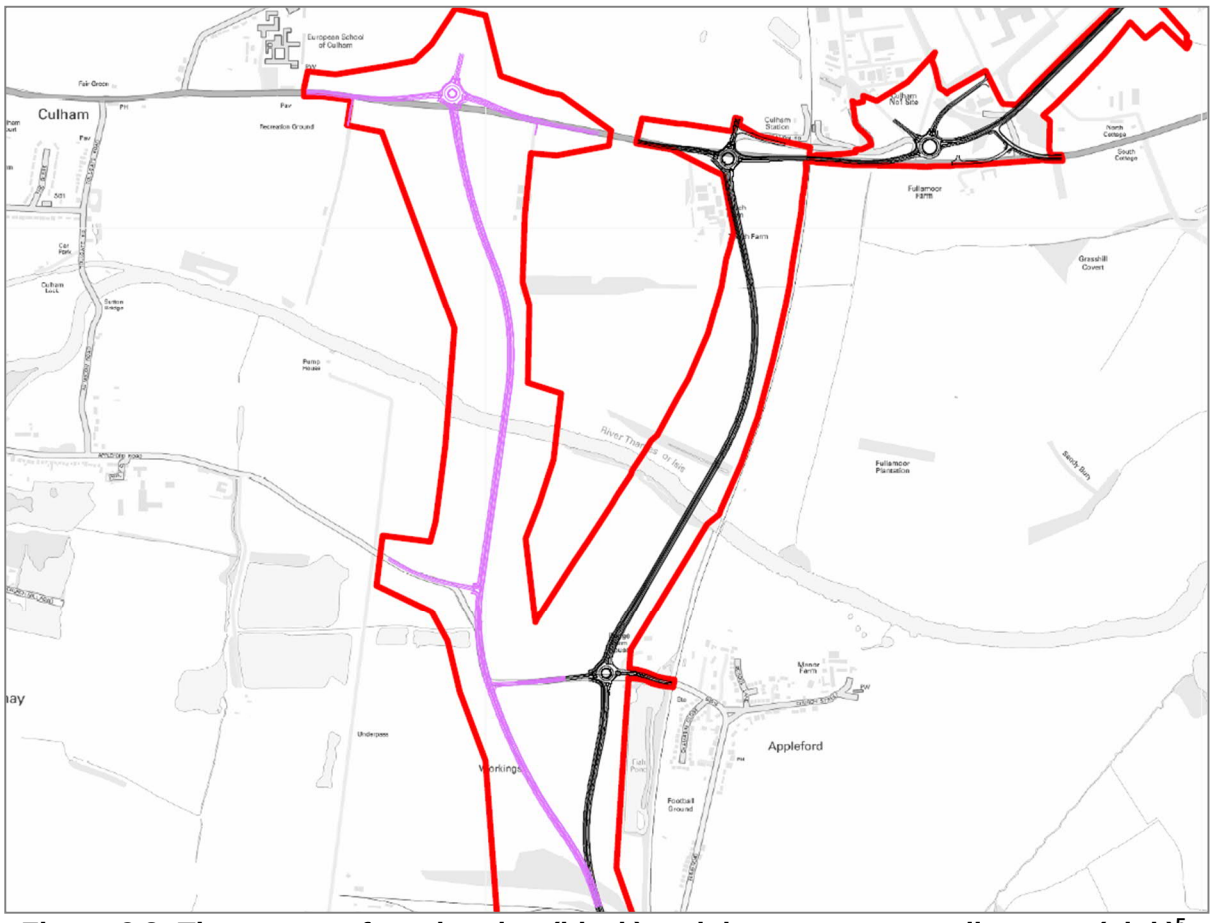

Figure 3.8: The once preferred option (black) and the new western alignment (pink)[5]

3.6.17 To address comments received during the November 2018 public consultation and following further design work, the new western alignment was designed and has the following environmental benefits:

- The alignment moved further away from the residential properties located in Appleford and at Zouch Farm (located between the River Thames and the A415), potentially reducing noise and air quality impacts at these properties.
- It reduces the potential for unknown archaeological impacts of the Scheme, as quarrying and landfill activities will have sterilised the land in terms of archaeological finds; and
- Avoiding potential for impacts on known archaeological monuments located close to the once preferred alignment, some of which are demonstrably equivalent in significance to a 'Scheduled Monument' and in-line with the NPPF, they will require equivalent protection.

3.6.18 For these reasons, the new western alignment was included in the Scheme design.

Amendments to the new western alignment (pink alignment)

3.6.19 The new western alignment featured a priority T-junction for Sutton Courtenay (see Figure 3.8), however traffic modelling showed that this resulted in queues and delays back towards the village, reducing the benefits of the Scheme on the existing river crossing at Sutton Bridge and Culham Cut, therefore a roundabout was included. In the first iteration of this design the roundabout was on-line on the existing B4016. This was subsequently moved off-line to reduce construction waste material, improve buildability, and reduce the requirement for traffic management during construction.

[5] Note: the pink alignment is now also superseded – see paragraph 3.6.20.

This change to the alignment marginally increases agricultural land take on best and most versatile land as the new highway utilises more greenfield land rather than utilising the alignment of the B4016. However, the Scheme's design incorporates the current B4016 road surface as a dedicated, two-way, cycle path, dedicated pedestrian footpath and shared pedestrian footpath and cycle way. .

3.6.20 Through design iteration, the pedestrian and cycle facility located along the majority of the Didcot to Culham River Crossing (from Hill Farm to the junction with the B4016) was moved from the western side of the new road to the eastern side, see Figure 3.9 and Figure 3.10 for a comparison. This ensures a more cohesive route for the majority of expected journeys, whilst pushing the carriageway approximately 8 m west from residents in Appleford, helping to mitigate any potential noise and air quality impacts.

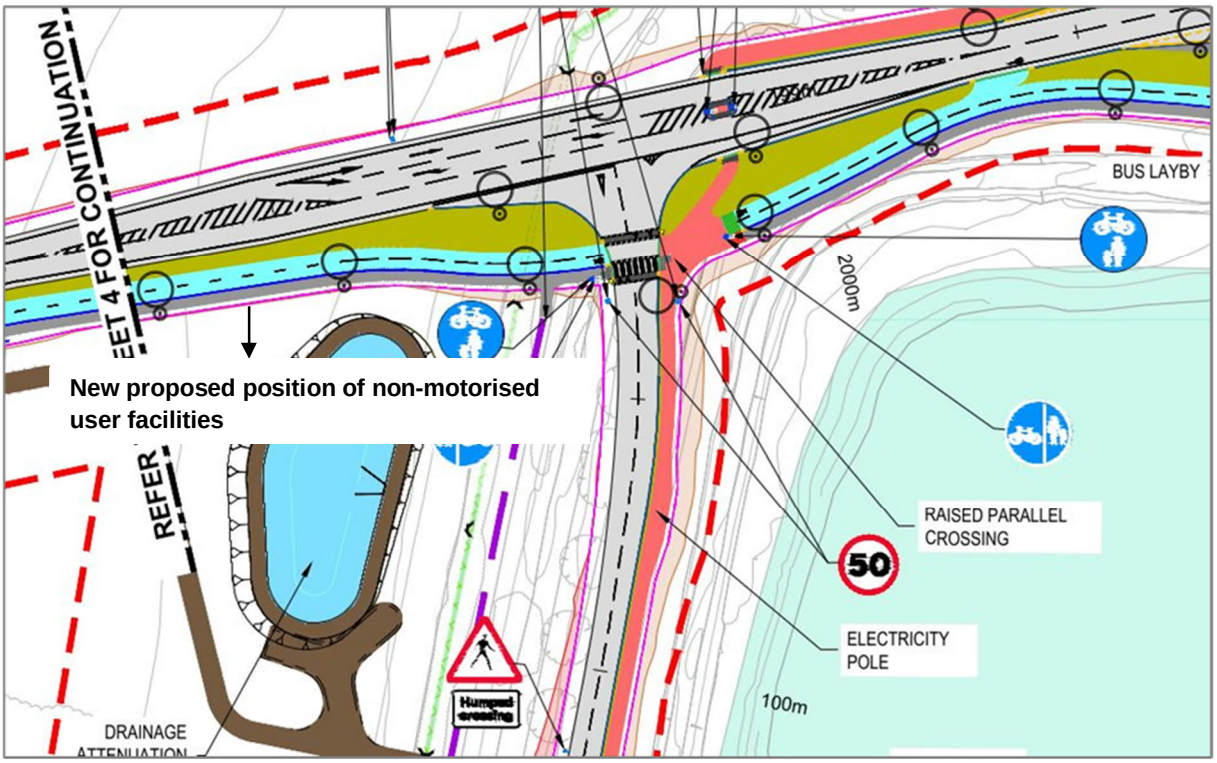

Figure 3.9: illustration of the now proposed position for non-motorised user facilities

3.6.21 Furthermore, the new western alignment (pink alignment) was altered to extend northwards along the western boundary of the agricultural field north of the River Thames. The main benefit of this is that the remaining land within this field is more useable to the landowner, as it is not split into two halves.

The B4016 into Appleford

3.6.22 A decision was taken by OCC to improve the link road (B4016) from the Scheme leading into Appleford. It was initially proposed to include pedestrian facilities between the Scheme and Appleford and locate these facilities on the southern side of the B4016 leading to Appleford (i.e. adjacent to the westbound carriageway), see Figure 3.10.

3.6.23 The improvement to the B4016 will require significant removal of trees located immediately adjacent to the westbound carriageway. It was decided to move this facility to the northern side of the road to enable the retention of trees.

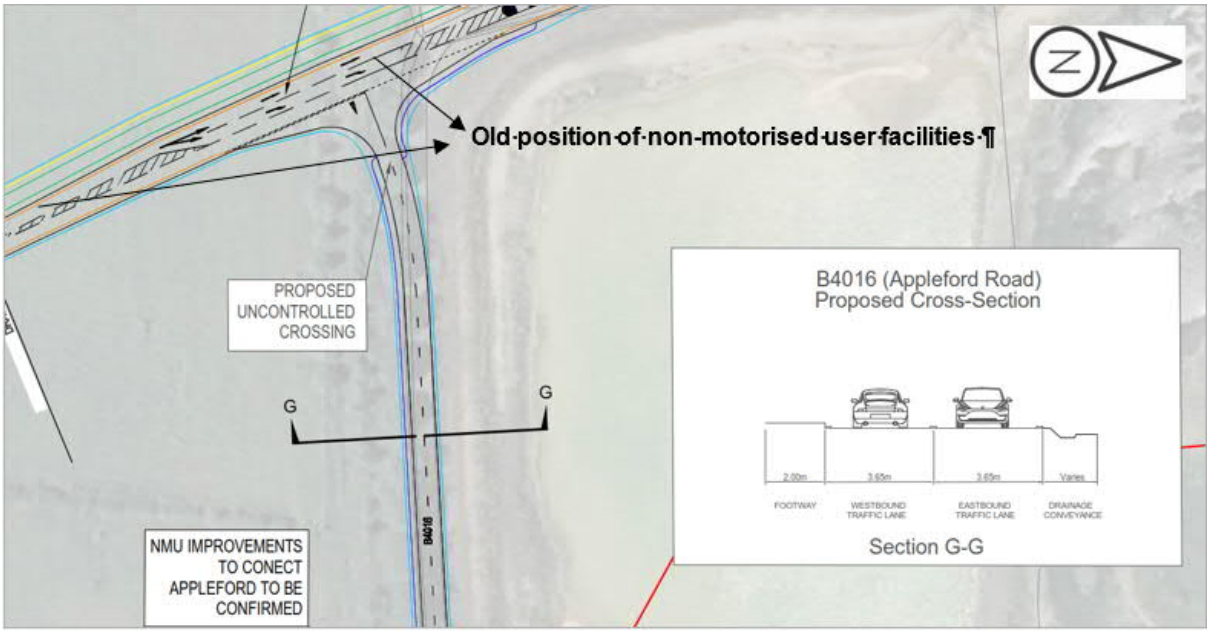

Figure 3.10: Initial design for pedestrian facilities along the B4016 into Appleford

Alignments and amendments suggested by Appleford Parish Council (APC)

Suggested alignments

3.6.24 On the 7th of January 2021, APC provided OCC with a position paper (see Appendix 3.2) which requested that the alignment for the Didcot to Culham River Crossing be moved further to the west of Appleford. Figure 3.11 shows the APC alternative route.

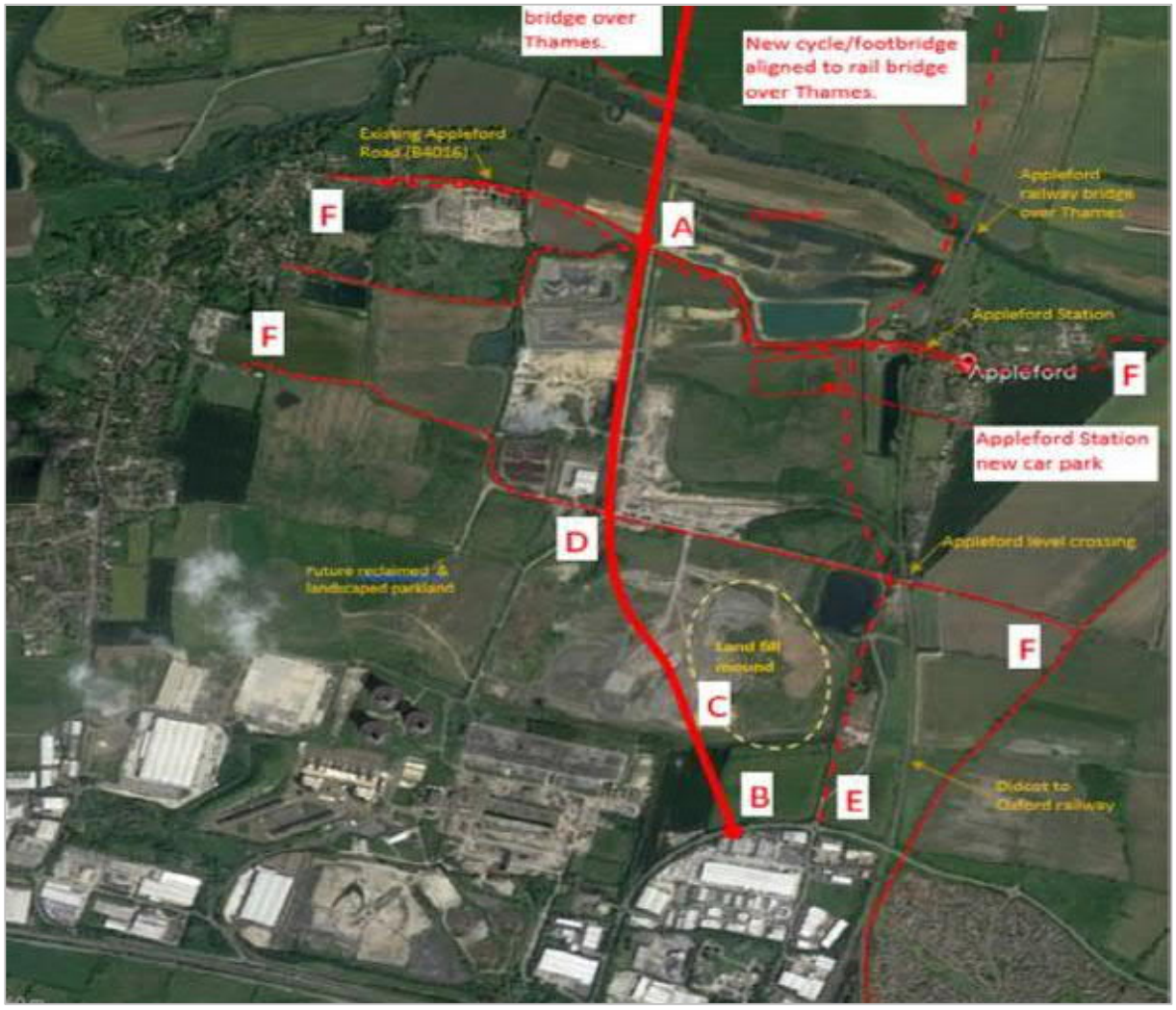

Figure 3.11: Alternative alignment proposed by APC

3.6.25 Following receipt of this position paper, OCC re-engaged with landowners and businesses that will be affected to understand if they will have objections to the alternative alignment. These responses are summarised below (see Appendix 3.3 for further detail):

- **RWE – Power Station:** A road along this alignment could not be allowed *"because of the existence of critical infrastructure along Corridor Road, required for the operation of Didcot Power Station"*. No objection will be raised if the alignment was shifted to land adjacent to Corridor Road, however, this land is operated by Hanson, who are intensifying their mineral operations in this area.
- **Hanson – Minerals Operation:** Hanson stated that they are intensifying their site operations onto their sidings land, east of Corridor Road. They have multiple accesses for HGVs on both Corridor Road and Portway and confirm they are all required for the safe operation of their site. Multiple accesses from the Scheme to their land will need to be created which will not be appropriate in the interests of highway safety and capacity.
- **FCC – Landfill:** FCC stated that the proposed alignment extends through their future landfill areas within this strategic waste site, which will sterilise some areas and require the site to cease operation prematurely. They also explained how some of the areas are permitted to be circa 40 m deep engineered landfill, which will pose significant challenges in building a road over this land.

3.6.26 OCC relayed this information to APC, who subsequently amended their alignment to address these constraints. Figure 3.12 below illustrates two additional alignments.

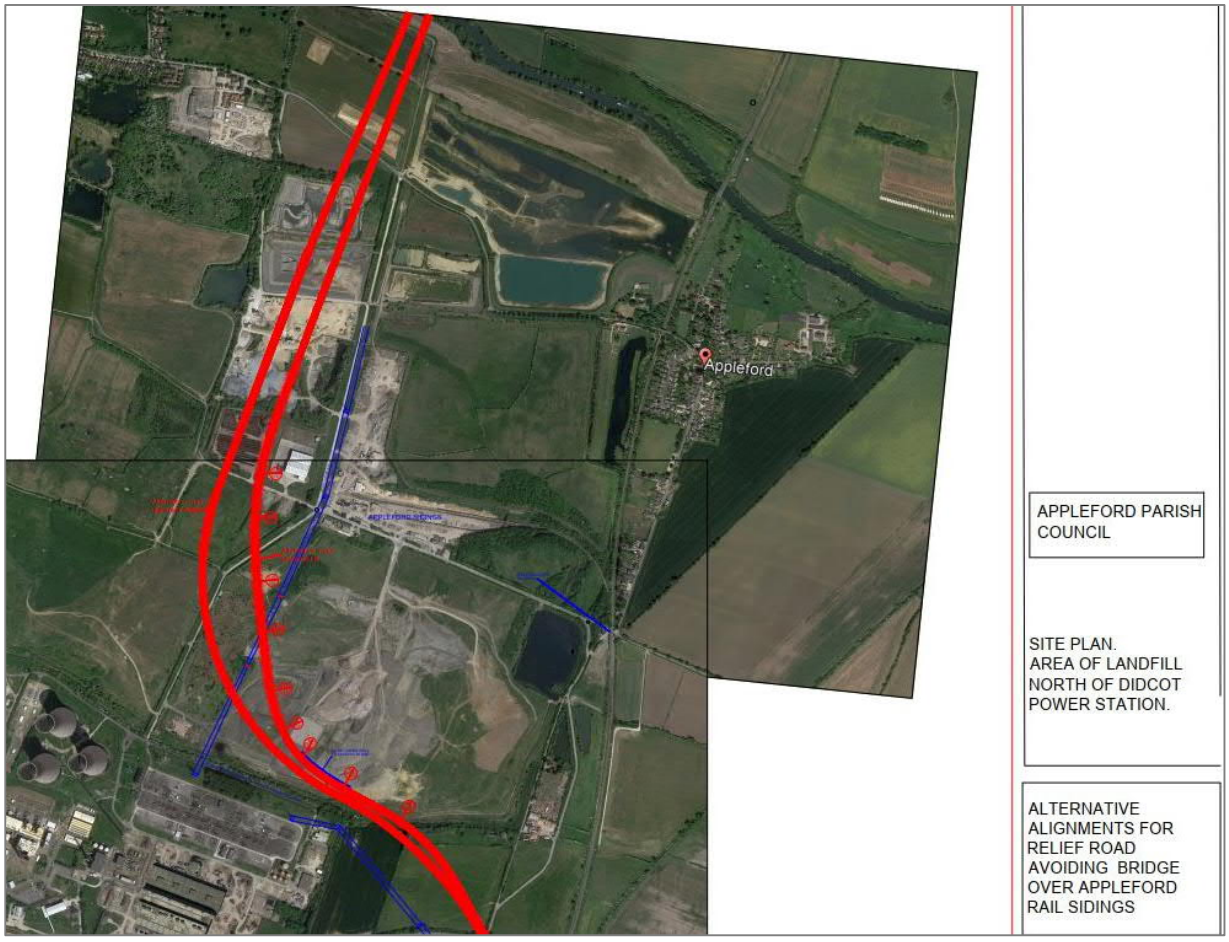

Figure 3.12: Two additional alignments provided by APC

3.6.27 These alignments were also considered unfeasible for numerous reasons (see Appendix 3.3 for the full list), but environmental reasons include:

- The routes through sections of land reserved by FCC for future landfill will sterilise part of this strategic site (site has permission to operate until year 2030) and will have an impact on the ability of the region to dispose of waste;
- There are environmental contamination challenges with the extraction of material from an old landfill site;
- Ground settlement is likely to occur in that location for circa 10 years, therefore it is likely a road will need to be built as a structure using piles through the landfill, or the waste will need to be excavated, incurring additional financial and environmental costs;
- Gas is likely to be emitted from these landfill cells for circa 15 years;
- Protected species are present along this corridor, which is similar to the corridor for the Scheme;
- A longer, less direct route will be less attractive for walking and cycling, adversely affecting a modal shift towards non-motorised travel. APC suggested that this can be resolved by constructing a second route for pedestrians and cyclists only, on a similar alignment to the Scheme's alignment. However, this will require additional land and will likely have additional environmental impacts; and

- The alignment will be located closer to other properties located off Appleford Road in the neighbouring Parish of Sutton Courtenay.

3.6.28 OCC relayed this information to APC, who subsequently sought to amend their alignment to address these constraints. Figure 3.13 and Figure 3.14 illustrates this final suggested alignment.

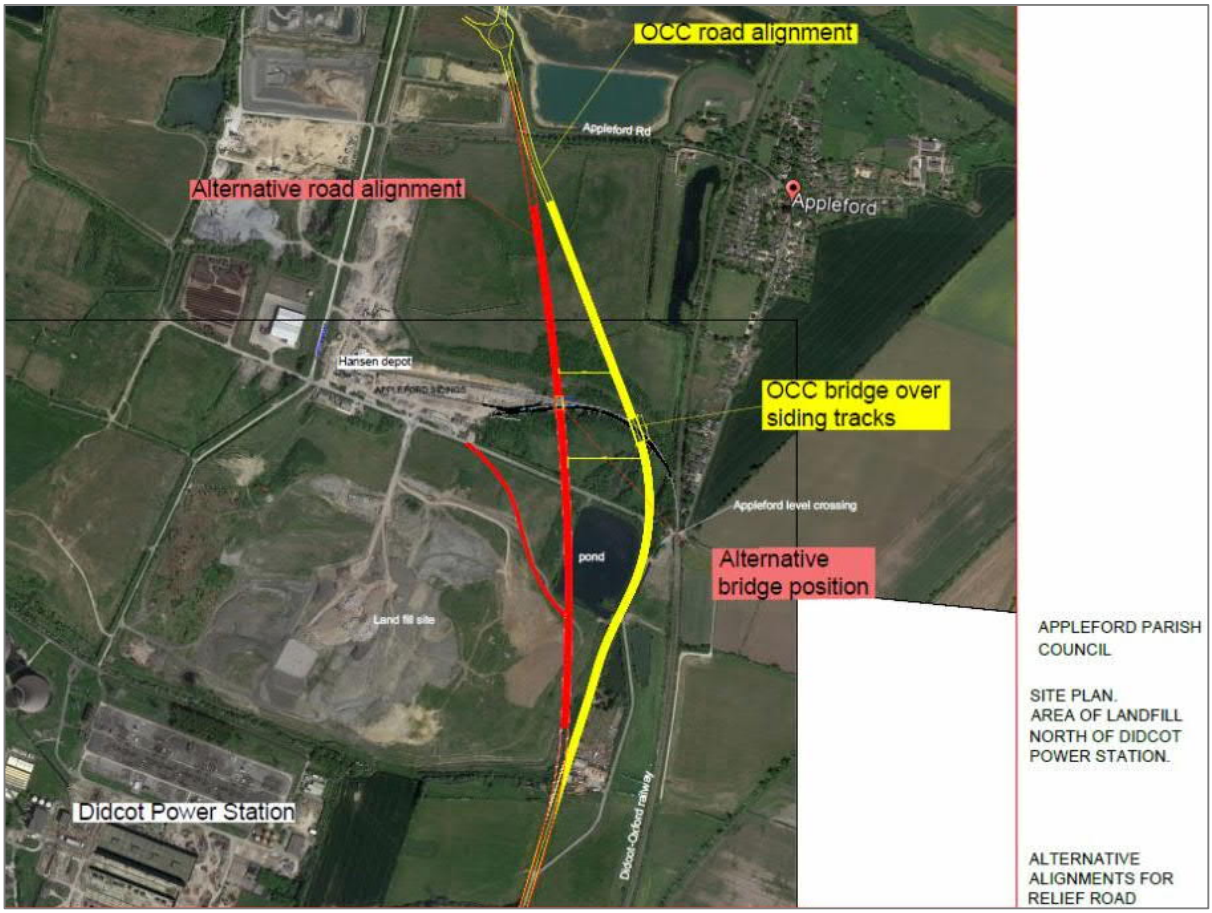

Figure 3.13: Amended APC alignment

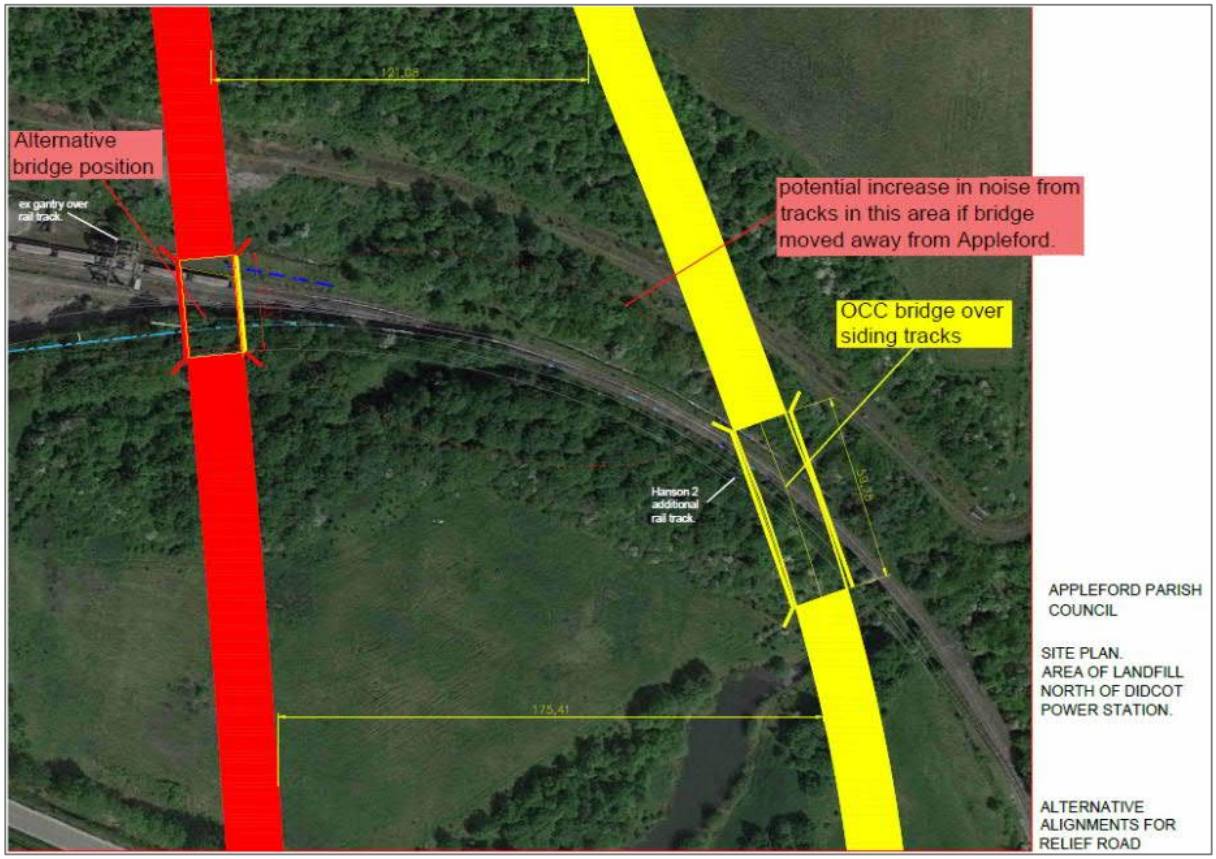

Figure 3.14: Amended APC alignment – bridge crossing over the Appleford sidings

3.6.29 This alignment was also considered unfeasible for several reasons (see Appendix 3.3 for the full list), but environmental reasons include:

- The route extends through landfill cells 9 and 10 to the south-west of the lake. Ground settlement is likely to occur in this area for circa 10 years. Therefore, it is likely a road will need to be built as a structure using piles through the landfill, or the waste will need to be excavated. Both options will likely lead to environmental contamination issues which will be difficult to mitigate;
- Ground gas is likely to be emitted from these landfill cells for circa 15 years, which could pose a risk to the end users of the road; and
- Protected species are present along this corridor, which is similar to the corridor for the Scheme.

3.6.30 Owing to the aforementioned environmental issues, engineering issues and budgetary issues (see Appendix 3.3 for further detail) with the alignments suggested by APC, they have not been considered further.

3.6.31 APC accepted that there are issues with constructing a road through an area that includes operational and historic landfill sites and requested that other options to reduce the impact of the Scheme be considered. It was requested that a bridge structure over the lake located to the west of the Scheme be considered, which will move the alignment west by 100 to 200 m. Given the lake's size, depth, and volume, a road across it will either need to be a viaduct type structure or some of the lake will need to be in-filled. This will have several constraints (see Appendix 3.3 for the full list), but environmental constraints will likely include:

- There will be adverse environmental effects associated with filling in an aquatic habitat. This will place a greater challenge for the Scheme to compensate for this loss;

- A significant volume of fill material will be required to be imported to in-fill part of the lake, if required, as there are very few cuttings (which will generate in-fill material) across the Scheme. Aggregates will need to be transported by road or rail to the Site, leading to further adverse environmental effects;
- Trees surrounding the lake (all grade C with one notable grade B, T106, see the Tree Survey Report and Constraints Plans, AECOM 2021, appendices to the Arboricultural Impact Assessment, which has been submitted with the planning application for the Scheme for further details) and located north of this area (through which this alignment will need to extend) will require felling, the majority of which are not affected by the Scheme;
- The rail sidings bridge span and height will likely increase due to the new crossing location, which will likely have greater landscape and visual effects;
- It is noted in ES Chapter 9: Biodiversity that this lake (waterbody 07 (WB07)) supports European Eel *Anguilla anguilla* and European Bullhead[6] *Cottus gobio*, as well as uncommon aquatic macrophyte and macroinvertebrate species. WB07 are considered to be of District biodiversity importance and European Eel and European Bullhead are up to County biodiversity importance. ES Chapter 9: Biodiversity states that there is likely to be a slight adverse effect as a result of the loss of a section of WB07 and the resulting loss of habitat for European Eel and Bullhead during construction, which is not significant. More substantial works to this lake than currently proposed as part of the Scheme, will likely have greater adverse effects on these populations; and
- This lake is part of FCC's restoration masterplan for the area and is subject to a specific planning condition which states that lake should "*encourage the foraging and roosting of wading and overwintering birds such as lapwing, greenshank and sandpiper*" in accordance with the then National Planning Policy.

3.6.32 Owing to these reasons, and other engineering and budgetary issues, this option has not been considered further.

Other suggested amendments

3.6.33 APC asked OCC to consider whether the structure over the Appleford sidings could be replaced with a level crossing. Through discussions with Hanson, FCC and Forterra, it is understood that throughout the day freight trains are shunted back and forth along the rail sidings as wagons are loaded and unloaded. Trains will be sitting under the structure over the Appleford sidings for long periods of the day, as and when required by the operations of the private companies. This will prevent the new road from serving its purpose, as it will be severed by stationary trains.

3.6.34 Additionally, in the event where trains are not stationary under the structure, driver delay as a result of a level crossing will make the Scheme less attractive for non-motorised users. This could result in drivers continuing to route via the existing river crossings and through surrounding villages, including Appleford, thereby diminishing any environmental benefits brought about by traffic redistribution and reduction in neighbouring villages, such as beneficial noise and air quality impacts.

3.6.35 Owing to these constraints, a level crossing facility has not been considered further.

[6] European Eel is listed as a species of principal importance under Section 41 of the NERC Act, as a UKBAP 2010 species and a LBAP priority species. It is also critically endangered under the IUCN Red List of Threatened Species. European Bullhead is an Annex II species under the Habitats Directive, which means they are a species of Community interest (i.e. endangered, vulnerable, rare or endemic in the European Community) whose conservation requires the designation of special areas of conservation. Bullhead is also a UK BAP priority species.

3.6.36 APC, in their position paper (see Appendix 3.2), also set out that they did not agree with the use a unsignalised T Junction connecting the B4016 with the Scheme as this could potentially increase driver journey times between Appleford and Sutton Courtenay. The two villages share a historic and current connection, with many of Appleford residents travelling to Sutton Courtenay to use local amenities. APC suggested that direct link to the Sutton Courtenay roundabout will help retain this connection. However, OCC advised that there should be a balance to enable Appleford residents to access the Scheme, without inviting significant numbers of drivers from other areas (including from areas that are allocated for housing development) to travel through Appleford village. Owing to this, the unsignalised T junction, designed in accordance with DMRB CD 123 (Ref 3.21), remains a part of the Scheme.

Delivery and input alternatives

Appleford rail sidings

3.6.37 The following possible superstructure options were assessed for the Appleford sidings bridge (Ref 3.17) but were discounted at an early stage as they were not deemed worthy of further examination:

- In-situ reinforced concrete deck –to achieve the required span, a reinforced concrete voided deck will be required. The deck will have to be supported by a temporary falsework system during construction, which will impose severe restrictions on rail movements and is therefore unfeasible. The deck will be too heavy to economically construct offline and move into place.
- Post-tensioned concrete beam deck – post-tensioned concrete beams will not be as economic as a pretensioned beam deck for a bridge of this span as it will require bespoke shuttering for in-situ or precast sections.
- Steel composite ladder type deck – the girder sections are deeper than an equivalent multi girder bridge deck. It will not be feasible within the headroom and vertical alignment constraints. The proposed bridge is quite wide and will require heavy transverse members.
- Steel through-truss – this form of structure will be less economic than the equivalent steel half-through girder for the relatively short span and it will be visually obtrusive in the landscape.

3.6.38 Four different types of structures were worthy of further examination:

- Half-through steel girder;
- Steel tied arch deck;
- Steel composite multi-girder; and
- Precast pretensioned beams.

3.6.39 Additionally, four different span options were considered feasible, including:

- Two span bridge – positioned at a 45-degree angle relative to the mainline of the Scheme;
- Single span, square bridge – positioned at a 45-degree angle relative to the mainline of the Scheme;
- Single span, square bridge – positioned along the alignment of the Scheme mainline and at 45 degrees to the track; and
- Single span, skew bridge – positioned along the alignment of the Scheme mainline and parallel with the track.

3.6.40 A single span “oversized” bridge spanning square to the railway tracks to Appleford sidings yard is proposed at this location. The abutments on either end are curved and set parallel to the boundary constraints. The carriageway on top of the deck sits at approximately 60-degree angle to the span of the bridge. This is the preferred option for OCC and Hanson and provides the best value for money and minimises impacts on the environment. The proposed structure compared to a longer skew span bridge along the carriageway provides reduces the depth of construction and thereby, reducing the height of the approach embankments and associated impacts on environment and thus this option is deemed a more sustainable solution.

Delivery and mitigation alternatives

River Thames bridge design option and flood risk modelling

3.6.41 Several bridge options have been considered for the crossing of the River Thames (Ref 3.16). The main environmental constraints associated with the river crossing are the risks posed to flooding and the use of land which is required under planning condition to be restored following quarrying. To inform the bridge design initial high-level testing of two options, to represent the extremes of possible design solutions, was undertaken.

3.6.42 The first option, option 1A, was modelled as a bridge structure with a 75 m wide opening at the river location, with solid embankments on both the approaches. The soffit level was modelled at 51.17 m Above Ordnance Datum (AOD).

3.6.43 Storm events 5% Annual Exceedance Probability (AEP) and 1% AEP + 35% climate change events were tested. The results of the modelling showed that the implementation of option 1A will create a flow constriction, as it will separate the floodplain upstream and downstream of the bridge. As a result of this, conveyance will be reduced and flows forced through a smaller area in the channel, instead of across the floodplain.

3.6.44 The second option, option 3, was modelled as a 120 m long bridge structure (30 m + 60 m + 30 m long spans including two, 1 m wide piers) at the river location with a series of viaduct spans (achieved with concrete culverts) (each 20 m long with clearance varying from 1 m to 4 m) on the approaches. The same soffit level as option 1A were used. The same storm event and climate change parameters were utilised for option 3 modelling.

3.6.45 Modelling showed that option 3 will cause an increase in the water levels upstream of the bridge, between 5 mm and 20 mm with some smaller areas witnessing greater depth increases of up to 100 mm, when compared to the baseline scenario. Downstream there will be a decrease in the depth of water of up to 50 mm, when compared to the baseline scenario. Whilst depths will increase upstream and decrease downstream, the extent of floodplain will remain unchanged from the baseline scenario. This meant that no additional properties will be at risk of flooding.

3.6.46 It was determined that the division of the floodplain upstream and downstream as with option 3 by using a series of viaducts, instead of an embankment as with option 1A, will allow flows to pass along the floodplain with minimal constriction, and therefore will have less of an impact on the floodplain extents and flood depths.

3.6.47 Therefore, the principle of using viaduct spans (using concrete culvert units), with a clear span consisting of three separate sections, was taken forward for inclusion in the Scheme design, noting that the design has been further amended to further reduce the impact on flooding up and downstream of the river crossing.

3.6.48 From these two initial options, four additional options have been considered, to refine the arrangement of culverts to increase the effectiveness of the design. These options are as follows:

- Option 4 – viaduct with culverts to provide conveyance of flow;
- Option 5 – viaduct with revised vertical alignment, culverts sizing and distribution and inclusion of Appleford Road junction in the model;
- Option 6 – a further revision of Option 5, with the addition of pipe culverts; and
- Option 7 – This option incorporates a 145 m bridge span and viaduct to minimise the impact on flows in the river, as well as a flood storage compensation area, to offset the impacts caused by the proposed embankments at the edges of the floodplain, mitigating the residual impact on peak water levels.

3.6.49 The modelled results indicate that Option 7 will provide the least detriment within the constraints of the design. The modelled results of Option 7 demonstrate that in most locations water levels are predicted to be within ±5 mm of the baseline levels, for the 1% AEP design event including a +35% climate change allowance. There are two small areas where a 5 – 20 mm increase in water levels is predicted, but these areas are on open fields and gravel pits, and away from vulnerable receptors. This increase represents a very small percentage change.

3.6.50 Two options to achieve the desired span length over the River Thames were considered. These include a single span bridge and a three-span bridge.

3.6.51 A single span bridge over the River Thames will minimise the impacts on the floodplain as the bridge priers can be provided with a greater distance between them. Additionally, there is less potential for sediment release from the riverbank during construction. However, this will require a tied arch structure (similar to the Appleford Railway Bridge on the downstream side), which will increase the overall height of the bridge, potentially leading to greater landscape and visual impacts.

3.6.52 A three-span bridge will potentially require more bridge piers in the floodplain. However, the piers are positioned away from the river and hence will not affect the normal flow of the river. Also, the overall height of the bridge will be lower, possibly resulting in fewer adverse landscape and visual impacts compared to the single span option.

3.6.53 The viaduct spans are proposed on the south approach to the main bridge over the River Thames (Option 7). This option includes replacement of culverts with longer viaduct spans to improve conveyance. The viaduct spans are proposed with similar form of construction as the main bridge over the River Thames and optimised to ensure a minimum headroom clearance of 0.6 m is available at all locations over the 1% AEP + 70% climate change flood level. This helps in optimising the whole length of this alignment over the flood plain to be not too high to potentially affect landscape and aesthetics and not too low to adversely impact any environmental issues.

3.7 Clifton Hampden Bypass

Design and delivery alternatives

Realignment of the Clifton Hampden Bypass

3.7.1 In response to the public consultation undertaken in November 2018 (Ref 3.18), the alignment of the Clifton Hampden Bypass was redesigned so that it is further from residences around the outskirts of the village, whilst still meeting the requirements of DMRB. Figure 3.15 shows the once preferred alignment in green, an alignment in red which is further from properties but will not meet DMRB requirements for a 60 mph road, and the alignment included with the design at the feasibility stage (2020). At the beginning of the preliminary design stage, following comments from residents living in Clifton Hampden regarding potential noise and air quality impacts, the decision was made to reduce the speed limit on the bypass from 60 mph to 50 mph. This allowed the alignment to shift north to a position similar to the red alignment.

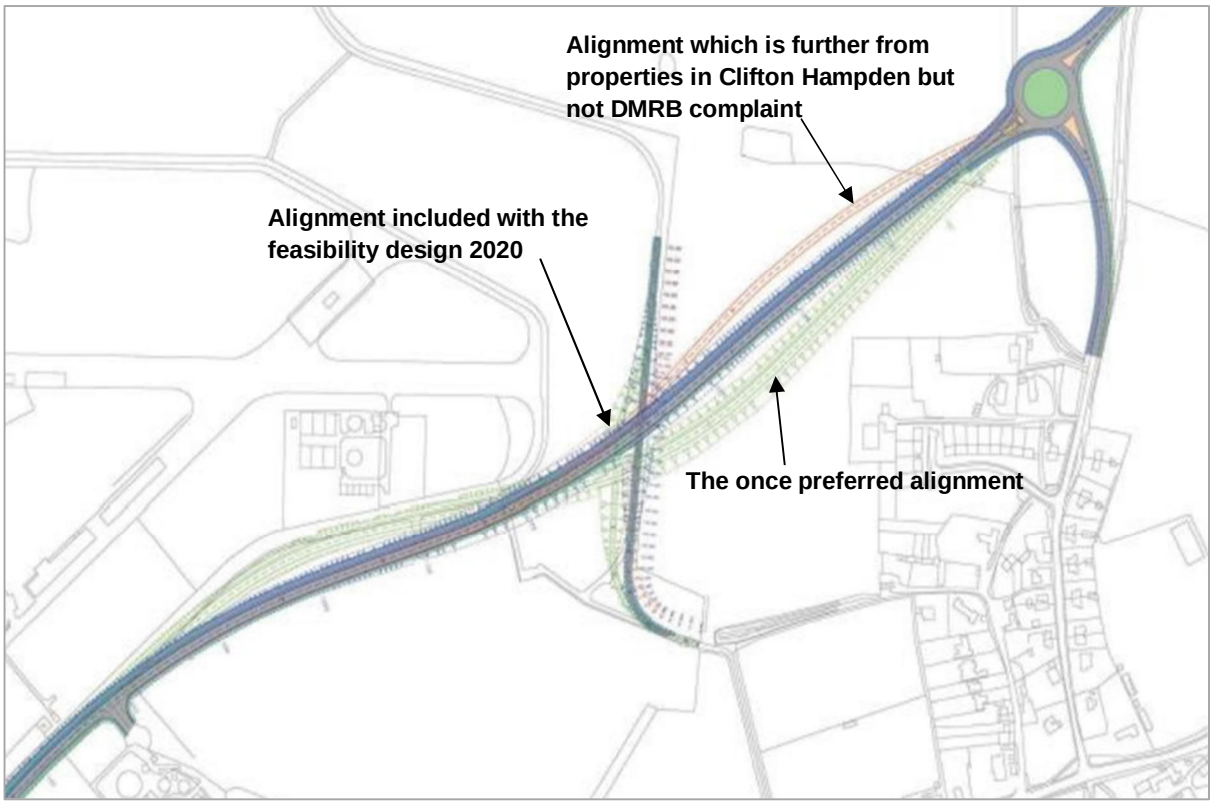

Figure 3.15: Clifton Hampden Bypass alignment options (figure shows the once preferred 60 mph alignment in Green and a DMRB non-compliant alignment in red)

3.7.2 In addition, Figure 3.15 shows a roundabout where ghost island priority junction (this can be seen in Figure 3.16) is now proposed. The decision was made at the beginning of the preliminary design stage to substitute the roundabout with a ghost island priority junction as it helps to reduce the eminence of the village junction with the aim of reducing through traffic in the village. This also helps to address comments received by local residents in relation to noise from accelerating vehicles at a roundabout, and visual impacts. A ghost island priority junction will reduce the number of vehicles accelerating and will reduce the visual massing of the Scheme, in this location. Additionally, a roundabout will require more street lighting, therefore the Scheme design without a roundabout helps to minimise any change in character at the northern end of the village.

3.7.3 Furthermore, Figure 3.15 shows a proposed underpass crossing an existing farm access track at the centre of the frame. The decision was made at the beginning of preliminary design stage to substitute the underpass for an at-grade priority junction. The at-grade priority junction allows the alignment of the Scheme to be constructed at a lower level, therefore, having less of an impact on the landscape, visual amenity and noise sensitive receptors. The farm access track has been realigned to achieve an acceptable junction angle with the bypass, as per DMRB.

Realignment in relation to Category A Oak Tree

3.7.4 Along the alignment of the B4015 Oxford Road, a Category A, large mature oak tree located north of Clifton Hampden was identified as a notable tree within the Site. Category A trees are high-quality trees which should be retained. The tree in question is also noted as being a distinctive feature on the approach to and exit from Clifton Hampden as it is the only tree on the west side of the road. It is regarded as a key landscape feature providing significant landscape and amenity value to the surrounding area. As part of previous designs, this tree will have required removal due to encroachment into the tree's Root Protection Area (RPA). Therefore, the alignment of the proposed B4015 connection, has been realigned to avoid the tree's RPA thus enabling its retention, as shown in Figure 3.16.

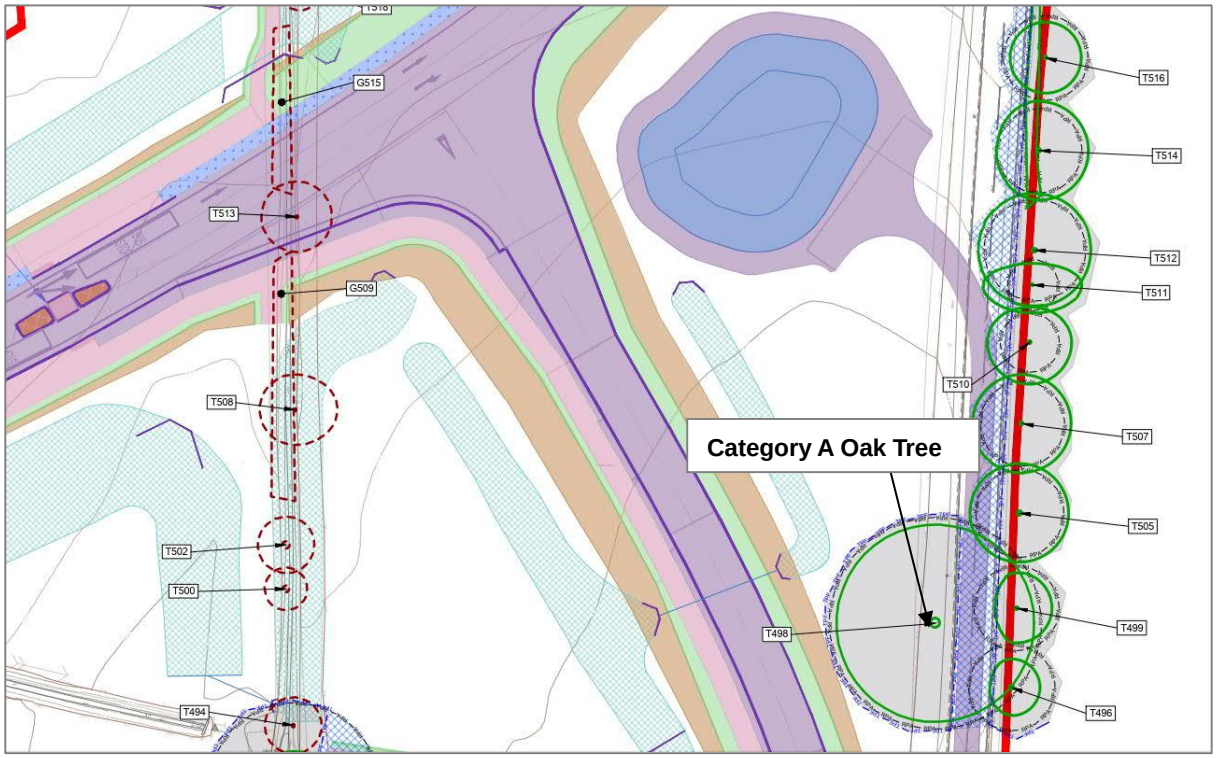

Figure 3.16: B4015 connection realignment in relation to Category A Oak Tree

3.8 Justification for the chosen option

3.8.1 As set out above, in preparing the design proposals for the development of the Scheme, a number of alternatives have been considered, in relation to appropriate alignments, engineering, scale, deliverability, traffic impacts, environmental impacts and also in terms of locations for growth around Didcot and surrounding areas.

3.8.2 The assessment of alternatives has determined that the Scheme design takes account of local and national planning policy and guidance, supports economic growth, provides road safety benefits, and has traffic flow benefits by improving journey time and reliability on the local road network. The Scheme does not result in

unacceptable transport impacts on either the local or strategic road networks, respects and provides opportunities to enhance the natural environment and has incorporated aspects that address issues such as climate change and sustainability.

3.8.3 The needs of non-motorised users have been incorporated into the Scheme design. The considerations included for public rights of way (PROW) will result in improvement to accessibility, amenity, equality and overall health and wellbeing.

3.8.4 It is been illustrated that the Scheme design is an appropriate development solution for addressing the aims of the Scheme, whilst avoiding and minimising environmental, social and economic impacts.

3.9 References

Ref 3.1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 https://www.legislation.gov.uk/uksi/2017/571/contents/made.

Ref 3.2 Ministry of Housing Communities and Local Government, The Planning Practice Guidance (PPG) https://www.gov.uk/government/collections/planning-practice-guidance.

Ref 3.3 Highways England, DMRB, Sustainability & Environment Appraisal, LA 104: Environmental Assessment and Monitoring, 2020.

Ref 3.4 Oxfordshire County Council, Didcot Science Bridge Scoping Report, 2014.

Ref 3.5 Oxfordshire County Council, Didcot to Culham New Road and Thames Crossing: Optioneering and Proof of Concept, 2015.

Ref 3.6 Oxfordshire County Council, Access to Science Vale: Option Assessment Report, Part 1, 2018.

Ref 3.7 Oxfordshire County Council, Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass Extended Feasibility Appraisal – Flood Study Report, 2018.

Ref 3.8 Oxfordshire County Council, Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass Extended Feasibility Appraisal – Landscape and Visual Appraisal, 2018.

Ref 3.9 Oxfordshire County Council, Didcot to Culham Link Road, Thames Crossing – Archaeological Desk-Based Assessment, Alignment 1, 2018.

Ref 3.10 Oxfordshire County Council, Didcot to Culham Link Road, Thames Crossing – Archaeological Desk-Based Assessment, Alignment 3, 2018.

Ref 3.11 Oxfordshire County Council, Didcot to Culham Link Road, Thames Crossing and Clifton Hampden Bypass – Built Heritage, 2018.

Ref 3.12 Oxfordshire County Council, Housing Infrastructure Fund 1 Outline Business Case: Environmental Assessment Report, November 2018.

Ref 3.13 Oxfordshire County Council, Housing Infrastructure Fund 1 Outline Business Case: WebTAG Preliminary Environmental Impact Appraisal Report, December 2018.

Ref 3.14 Oxfordshire County Council, Access to Science Vale: Option Assessment Report, Part 2, 2019.

Ref 3.15 Oxfordshire County Council, Didcot Garden Town HIF1: Options Assessment Report, 2021.

Ref 3.16 Oxfordshire County Council, Didcot Garden Town HIF1: Didcot to Culham River Crossing, River Thames Bridge and Approaches - Options Study, 2021.

Ref 3.17 Oxfordshire County Council, Didcot Garden Town HIF 1: Didcot to Culham River Crossing, Appleford Sidings Road Bridge, Options Study, 2020.

Ref 3.18 Oxfordshire County Council, Improving transport for Didcot and the surrounding area, 2018. Available at: https://consultations.oxfordshire.gov.uk/Access_DGT/consultationHome.

Ref 3.19 Vale of White Horse District Council, Evaluation of Transport Impacts Study to inform the Local Plan 2031: Part 1 Strategic Sites and Policies, 2014. Available at: https://data.whitehorsedc.gov.uk/java/support/Main.jsp?MODULE=FolderView&ID=910605701&CODE=7CAF110B631BCF98EDAD994696E9106B&NAME=Local%20Plan%202031%20Part%201%20Examination%20Library&REF=VALE_2031&REFERER_URL_IN=&SOVA_IN=VALE#exactline.

Ref 3.20 South Oxfordshire District Council, South Oxfordshire District Council Local Plan, Evaluation of Transport Impacts: Stage 1 - Development Scenarios, 2017. Available at: https://data.southoxon.gov.uk/ccm/support/Main.jsp?MODULE=FolderView&ID=1421403146 &CODE=3187906E1C19C2DBD31A7EACD8810ADF&NAME=Local%20Plan%202035%20Documents%20and%20Evidence%20Base&REF=SLP_EXAMLIB&REFERER_URL_IN=&SOVA_IN=SOUTH#exactline.

Ref 3.21 Highways England, DMRB, Road Layout, CD 123: Geometric design of at-grade priority and signal-controlled junctions, 2020.