1 Executive Summary

1.1.1 Monitoring was undertaken across C1 throughout February 2023 in response to site construction activities. Graphs showing the monitoring data for the month are attached in Appendix A.

1.1.2 Monitoring at Chalfont St Peter (CSP) ventilation shaft remained at a quarterly monitoring frequency, whilst monitoring at Chalfont St Giles (CSG), Amersham (AMS), Little Missenden (LMI), and Chesham Road (CHR) ventilation shafts, along with the North Portal (NPTL) continued monthly in line with the SSMP's.

1.1.3 Monitoring at Colne Valley Viaduct (CVV) module 1 continued at a weekly frequency following completion of the rotary bored piling (RBP) works in January. Monitoring at Modules 4, and 2 remained at a monthly monitoring frequency. Monitoring at Module 3 was not undertaken following the completion of the RBP works within the area in November.

1.1.4 CFA piling was undertaken at the North Embankment (NE) and completed on 6th February. The remaining 40 out of 209 piles were drilled.

1.1.5 Decking activities advanced to P49, with surface water monitoring ongoing on a weekly basis for ML028-SW004 and ML028-SW003.

1.1.6 Additional monitoring was conducted within the CVV in response to remedial works, piling cap pours, and concrete plug pours. No impacts have been observed.

1.1.7 Tunnel monitoring continued at a mixed frequency of monthly, weekly, and daily. The highest frequency of monitoring is in a 150 m area upgradient and 300 m downgradient of each tunnel boring machine (TBM) as defined by the SSMP.

1.1.8 Cross passage (CP) monitoring continued at CP10, CP11, CP12, CP15.

1.1.9 Monitoring across the South Portal and Western Valley Slopes areas continued at a monthly monitoring frequency, with continued surface water monitoring of the drainage systems. Pynesfield monitoring remains at a fortnightly monitoring schedule.

1.1.10 The priority monitoring round was completed, with all locations visited where possible.

1.1.11 BH2 continues to trend towards higher pH than the other Pynesfield boreholes. In February, a peak of 9.4 pH was recorded on the 16th and 9.3 pH 17th. This was short lived with subsequent visits returning to below 9 pH. The reason for this is currently uncertain. However, the Pynesfield ditch has been drained and partially cleared of chalk silt. The remainder of the chalk silt removal is scheduled for mid-March. An inspection of the liner will follow.

1.1.12 Following the January leak of the CSP Pond, all shaft attenuation ponds were drained, cleaned, and inspected by the end of February. At time of writing, any required repair works have not yet been completed, but are scheduled for early March.

1.1.13 Results from ML034-RO408 (downgradient of CSP Pond) indicate some detection of pond water, but all within acceptable limits.

1.1.14 Very low rain was observed during the month at Chenies rain gauge on 6 days with a total of 4 mm recorded. 4 days of rainfall recorded across the South Portal site with 2 mm recorded.

1. Site Specific Monitoring

Overview

1.2 A high-level overview of the water monitoring activities and occurrences at each site is provided below for the month. The graphs showing the in-field monitoring data are attached in the appendix.

Colne Valley Viaduct (CVV)

1.2.1 Works began on 9th January for the Continuous Flight Auger (CFA) piling at North Embankment and were completed on 6th February. The remaining 40 piles were drilled in February to a total of 209.

1.2.2 Concrete plugs were poured at piers 12 and 13 on the 24th February and piers 2 and 3 between the 27th February and 1st March. During the works, water monitoring was conducted at ML026-RO428 (piers 12 and 13), and ML026-RO428 (Piers 2 and 3). Both were monitored pre- and post-works with no impacts observed in the water quality results.

1.2.3 Piling caps have been poured at pier 17 (on 31st January) and pier 31 (9th February). Water monitoring has been carried out pre- and post-works for ML026-RC070, Harefield Lake No 2 (ML026-SW002, ML026-SW003) and Korda Lake (ML027-SW001, ML027-SW002) respectively with no impacts observed.

1.2.4 Further remedial works in the piles at Pier 19 were undertaken in February. Works have been conducted between the 16th and the 28th of the month. No impacts to water quality were observed at the nearby sentinel borehole ML026-RC070.

1.2.5 Decking works advanced from Pier 51 to Pier 49 in February, with 34 segments installed during the month. To date, a total of 207 segments have been installed.

1.2.6 Rotary bored piling (RBP) activity at the CVV was completed last month, with the last pile poured on 26th January. Therefore, no fluid loss was recorded in February.

CVV Module 1 (Pier 12 to South Embankment)

Groundwater

1.2.7 There were no trigger limit breaches in Module 1 during the month.

1.2.8 In response to the concrete plugs being poured at Piers 12 and 13, ad-hoc infield monitoring has been carried out at ML026-RO428. To date, no impacts on the water quality have been observed.

1.2.9 Table 1 compares typical borehole ranges for the area with trigger levels and any trigger level exceedances.

Table 1 CVV Module 1 borehole in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	6.7 – 7.7	620 - 1300	1 – 25	-50 - 300	1 – 11
Trigger limit	5 – 9	1500[1]	500	-	-
Trigger Level Exceedances	-	-	-	-	-
Exceeding borehole	-	-	-	-	-

1.2.10 Groundwater levels displayed a varied response in February, with ML026-RO428, ML026-CR032 and ML026-RO426 showing a decrease between 0.3 m and 0.7 m across the month. ML026-RO431 had an increase of 0.3 m, while ML026-RO430 has remained stable as the previous month.

1.2.11 Following the detection of TPH C7-C10 (aromatic) in the lab sample collected from ML026-RO426 on 4th January, further samples have been collected from the borehole on 3rd and on 9th February. Neither sample detected any presence of TPH, confirming that the sample of the 4th January was an isolated spike and unlikely to be related to Align activities. Discussions with S2 contractor SCS have mentioned the presence of TPH in groundwater owing to historic landfill contamination within/ close to their area.

1.2.12 On 9th February at ML026-RO426, a turbidity reading of 490 NTU was observed. On the following visit, on the 27th, turbidity was observed at 450 NTU, just below the 500 NTU trigger limit for Module 1. Within the surrounding area, excavation works for the concrete plugs have been undertaken at Piers 2 and 3. The excavation started at the end of January and ended by middle of February. It is possible that the excavation works have had an impact on the water surrounding this borehole, causing the observed spike in turbidity. Historically, this borehole has displayed variable turbidity

[1] Due to pre-existing contamination in the Module 1 area, EC values are generally higher than anywhere else in Section C1.

with elevated levels of turbidity recorded compared with other CVV M1 boreholes. The cause of this is uncertain.

Surface water

1.2.13 Surface water bodies within Module 1 include Harefield Lake No. 2 (ML026-SW002 and ML026-SW003) and New Years Green Bourne (ML026-SW005 and ML026-SW006), as well as the new monitoring location at the outlet of NYGB into the Harefield Lake No 2 (ML026-SW007).

1.2.14 The two monitoring locations (ML026-SW005 & ML026-SW006) on the NYGB both displayed high Electrical Conductivity (4,600 and 3,000 µS/cm respectively) in February, as in the previous month. Elevated versus typical values for ammoniacal nitrogen, potassium, sodium, calcium and chloride were also observed, in particular for the first half of the month; these are displayed in Table 2.

1.2.15 While calcium continued to display high levels as in January, sodium concentrations decreased from January's levels. Additionally, ammoniacal nitrogen, potassium, and chloride started to decrease in the second half of February. The NYGB is known to be affected by contamination from the New Years Green landfill. The stream is also likely affected by the council road gritting undertaken in response to cold weather along Harvil Road, although further investigation of this mechanism is required.

Table 2 New Years Green Bourne elevated determinand table

Location ID	Sampling date	Ammoniacal Nitrogen (µg/l)	Calcium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	Chloride (mg/l)
Typical Range	03/21 – 01/23	0-500	100-500	30-200	10-50	20-100
ML026-SW005	09/02/23	36,000	564	620	150	1,100
	23/02/23	24,280	910	394	90	24.5
ML026-SW006	09/02/23	34,000	549	300	142	490
	23/02/23	25,280	898	293	95	30

1.2.16 On the 1st February, hexavalent chromium (5 µg/l) was detected in the NYGB at our upstream location ML026-SW005 through our onsite laboratory. This result was analysed in the Align on-site laboratory detected. Our attenuation pond located close to Pier 5 was tested regularly throughout the month and no further hexavalent chromium was detected, it is therefore unlikely that Align are the source. Off-site lab analysis from the 16th February confirm no

presence of hexavalent chromium in upstream or downstream NYGB samples.

1.2.17 Table 3 compares typical surface water ranges for the area with any exceedances.

Table 3 CVV Module 1 surface water in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7.7 – 8.5	600 - 1200	1 – 20	0 - 300	7.5 – 13
Exceedances	-	4,600, 3,000	-	-	-
Exceeding location	-	ML026-SW005, ML026-SW006	-	-	-

CVV Module 2 (Pier 28 - Pier 13)

Groundwater

1.2.18 Table 4 compares typical priority borehole ranges for the area with trigger levels and any trigger level exceedances.

1.2.19 In response to the piling caps being poured at Pier 17 and to the remedial works undertaken at P19, ad-hoc infield monitoring was carried out pre- and post-works at ML026-RC070 with no significant changes observed in relation to the works.

1.2.20 There were no trigger limit breaches in Module 2 during the month.

Table 4 CVV Module 2 borehole in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7 – 8	600 - 850	1 – 25	50 - 300	2 - 8
Trigger limit	5 – 9	1000	250	-	-
Trigger Level Exceedances	-	-	-	-	-

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Exceeding borehole	-	-	-	-	-

1.2.21 Groundwater levels displayed a varied response in February. ML026-RC070 and ML027-RO062a showed a decrease of approximately 0.4 m and 0.1 m respectively, while ML027-RO400 an increase of approximately 0.2 m across the month

Surface water

1.2.22 Surface water bodies within Module 2 include Savay Lake (ML027-SW006), and Small Pond (ML027-SW004 and SW005), as well as the Grand Union Canal (ML026-SW001).

1.2.23 In response to the concrete works carried out P17, ad-hoc infield monitoring was undertaken on the surface water location for Harefield Lake No 2 (ML026-SW002 and ML026-SW003). No significant impact to the water body has been observed with all parameters within their normal range.

1.2.24 Table 5 compares typical surface water ranges for the area with any exceedances.

Table 5 CVV Module 2 surface water in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7 – 7.7	700-850	1 – 25	0 - 250	6 – 13
Exceedances	-	-	-	-	-
Exceeding location	-	-	-	-	-

CVV Module 3 (Pier 42 – P29)

Groundwater

1.2.25 Monitoring for groundwater impacts ceased in December at module 3 in line with the SSMP following completion of intrusive piling activities.

Surface water

1.2.26 Surface water bodies within Module 3 include the River Colne, Long Pond (ML028-SW001 and ML027-SW003), and Korda Lake (ML027-SW002 and ML027-SW001).

1.2.27 In response to the concrete works undertaken at P31, surface water location in Korda Lake (ML027-SW002 and ML027-SW001) was monitored pre- and post-works. No impacts on the water quality have been observed.

1.2.28 Table 6 compares typical surface water ranges for the area with any exceedances.

Table 6 CVV Module 3 surface water in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7 –8.5	550 - 900	1 – 25	50 - 250	7– 13
Exceedances	-	-	-	-	-
Exceeding location	-	-	-	-	-

CVV Module 4 (North Embankment to Pier 43)

Groundwater

1.2.29 CFA piling works, started at the North Embankment (NE) on the 9th January and were completed on 6th February. The remaining 40 piles were drilled during this month, out of a total of 209. The monitoring frequency at ML029-CR021 and ML029-RO431 was increased to weekly for the duration of these works, and to date, no impacts have been observed.

1.2.30 Table 7 compares typical priority borehole ranges for the area with trigger levels and any trigger level exceedances.

1.2.31 There were no trigger limit breaches during the month in Module 4.

Table 7 CVV Module 4 borehole in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	6.5 – 8	700 - 875	1 – 10	50 - 300	8 – 11
Trigger limit	5 – 9	1000	100[2]/250[3]/500[4]	-	-
Trigger Level Exceedances	-		-	-	-
Exceeding borehole	-		-	-	-

1.2.32 Groundwater levels displayed a varied response during the month, with ML029-CR010 increasing approximately 0.1 m and ML028-CR018 decreasing approximately 0.3 m across the month. Because monitoring has been reduced to a monthly frequency in line with works reducing in the area, we only have results for the first half of February at ML029-RO431, which showed an increase of approximately 0.2 m.

Surface water

1.2.33 Surface water monitoring was completed during the month with chemical sampling and gauge board readings collected where possible. Monitoring continued both weekly and monthly. Surface water bodies within Module 4

[2] ML029-CR010, ML029-RO431
[3] ML028-CR018, ML028-CR009
[4] ML028-CR006

include ML029-SW001, Denham Water-Ski Lake (ML028-SW004 and SW003) and the River Colne (ML028-SW002).

1.2.34 Decking activities advanced from P51 to P49 in February.

1.2.35 Table 8 compares typical surface water ranges for the area with any exceedances.

Table 8 CVV Module 4 surface water in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7.8 – 8.5	500 – 850	1 – 25	100 – 225	9 – 13
Exceedances	-	-	-	-	-
Exceeding location	-	-	-	-	-

Following the high calcium levels detected in the River Colne in January, analysis undertaken by our off-site laboratory in February showed that calcium has returned to typical levels (110 mg/l upstream and 120 mg/l downstream). While results from the Align onsite laboratory still displayed high levels of Calcium, with values ranging for the upstream location between 550-800 mg/l and for the downstream location between 650-900. Align is currently investigating the discrepancies in the results between the two laboratories.