

1 Executive Summary

- 1.1.1 Monitoring was undertaken across C1 throughout December 2022 in response to site construction activities. Graphs showing the monitoring data for the month are attached in Appendix A.
- 1.1.2 Owing to completion of major intrusive works at the Chiltern Tunnel Vent Shafts, the order of this report has been altered to bring the on-going below groundwater works at the Colne Valley Viaduct to the front of the report.
- 1.1.3 Monitoring at Chalfont St Peter (CSP) ventilation shaft remained at a quarterly monitoring frequency, whilst monitoring at Chalfont St Giles (CSG), Amersham (AMS), and Little Missenden (LMI) ventilation shaft sites continued monthly in line with the SSMP's. Chesham Road (CHR) and North Portal (NPTL) both reduced to a monthly monitoring frequency in response to reduced construction works.
- 1.1.4 Monitoring at Colne Valley Viaduct (CVV) module 1 continued at a weekly frequency in response to rotary bored piling (RBP) at piers 2-5. Monitoring at Modules 4, and 2 remained at a monthly monitoring frequency. Monitoring at Module 3 ceased in line with the site specific management plan following the completion of the RBP works.
- 1.1.5 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.
- 1.1.6 The priority monitoring round was completed, with all locations visited where possible. ML035-CR004 (RTD), ML035-RO003a, and ML039-RC002 (shallow) were reported as dry and could not be monitored.
- 1.1.7 One trigger level exceedance for pH (9.2) was observed on 19th December, at Chesham Road borehole ML046-RO507a. The cause is uncertain; however the event was short lived and didn't exceed drinking water standards (DWS). Off-site laboratory analysis from the same date reported pH as 8.4.
- 1.1.8 No further leaks from the Chalfont St Peter attenuation pond occurred in December indicating that the remedial works to the liner and outlet have resolved the issue. On-going monitoring of the levels in the CSP pond are being undertaken.

- 1.1.9 Rain was observed throughout the month at Chenies rain gauge, with 13 days of rainfall recorded across the South Portal site primarily in the second half of the month.

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 Rotary piling activities continued with the following locations worked on during the month:

- P1
- P2
- P3
- P4
- P5
- P11

1.2.2 Approximately 104 m³ of support fluid was lost between Pier 1 to Pier 5 during December. No impact on groundwater quality was detected as a result of these losses. Table 1 displays the reported losses.

Table 1 Support fluid loss in December >1m³

Pier	Loss (m ³)
P1	39
P2	18
P3	12
P4	13
P5	22

CVV Module 1 (Pier 13 to South Embankment)

Groundwater

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

1.2.4 Table 2 compares typical borehole ranges for the area with trigger levels and any trigger level exceedances.

Table 2 CVV Module 1 borehole in-field parameter data

	pH	SPC ($\mu\text{S/cm}$)	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	-	-	-	-	-

1.2.5 Groundwater levels displayed an increase across the month, increasing by approximately 0.2 – 0.5m. ML026-RO426 was the exception, where water levels displayed an initial decline (approx. 0.2m) at the start of the month before remaining stable.

Surface water

1.2.6 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).

1.2.7 An elevated pH observation of 8.9 was recorded by the monitoring contractor on 22 December at ML026-SW002. No corresponding EC or turbidity spike is observed. This location has exhibited high variability since July, but with greater extremes since November. This particular observation was a short-lived event and the cause of the elevated observation is unclear.

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

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

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

	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	8.9	-	-	-	-
Exceeding location	ML026-SW002	-	-	-	-

CVV Module 2 (Pier 28 - Pier 13)

Groundwater

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

1.2.10 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	7 – 11
Trigger limit	5 – 9	1000	250	-	-
Trigger Level Exceedances	-	-	-	-	-
Exceeding borehole	-	-	-	-	-

1.2.11 Groundwater levels displayed a steady increase of approximately 0.2m across the month.

Surface water

1.2.12 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).

1.2.13 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

- 1.2.14 Monitoring for groundwater impacts ceased in December at module 3 in line with the SSMP following completion of intrusive piling activities.
- 1.2.15 Table 6 compares typical priority borehole ranges for the area with trigger levels and any trigger level exceedances.
- 1.2.16 No trigger limit breaches were observed during the month in Module 3.

Table 6 CVV Module 3 borehole in-field parameter data

	pH	SPC (µS/cm)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7.1 – 7.9	600 – 775	1 – 25	100 – 300	3 – 9
Trigger limit	5 – 9	1000	250	-	-
Trigger Level Exceedances	-	-	-	-	-
Exceeding borehole	-	-	-	-	-

- 1.2.17 Groundwater levels displayed an increase of approximately 0.1-0.2 m across the month.

Surface water

- 1.2.18 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).

1.2.19 Table 7 compares typical surface water ranges for the area with any exceedances.

Table 7 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

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

1.2.21 Table 8 compares typical priority borehole ranges for the area with trigger levels and any trigger level exceedances.

Table 8 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 - 25	50 - 300	8 - 11
Trigger limit	5 - 9	1000	100 ² /250 ³ /500 ⁴	-	-
Trigger Level Exceedances	-	-	-	-	-
Exceeding borehole	-	-	-	-	-

1.2.22 Groundwater levels displayed an increase of approximately 0.2m across the month.

² ML029-CR010, ML029-RO431

³ ML028-CR018, ML028-CR009

⁴ ML028-CR006

Surface water

- 1.2.23 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 include ML029-SW001, Denham Water-Ski Lake (ML028-SW004 and SW003) and the River Colne (ML028-SW002).
- 1.2.24 Table 9 compares typical surface water ranges for the area with any exceedances.

Table 9 CVV Module 4 surface water in-field parameter data

	pH	SPC ($\mu\text{S}/\text{cm}$)	Turb (NTU)	REDOX (mV)	DO (mg/L)
Typical Range	7.8 – 8.5	500 – 650	1 – 25	100 – 225	9 – 13
Exceedances	-	-	-	-	-
Exceeding location	-	-	-	-	-