1EW02 Enabling Works – Area South

Document Title: Surface Water Monitoring Plan

Document number: 1EW02-CSJ-EV-PLN-S000-000078

Revision: C01
WP Reference: P016
MDL Reference: TBA

Revision	Date	Author	Checked by	Approved by	Revision Details
C01	23-06-2020	[redacted] Water Resource and Flood Risk Specialist	[redacted] Environmental Manager - Route	[redacted] Area South Environment and Sustainability Manager	Issued for Information
Signature		[redacted]	[redacted]	[redacted]	

REVISION CHANGES, AUTHORISATION & ISSUE RECORD

Version	Date	Sections revised	Brief description of the revision	Prepared by	Checked by	Approved by	Reason for Issue	HS2 Acceptance Decal Code
C01	23-06-2020	-	First issue	[redacted]	[redacted]	[redacted]	For Information	

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1 Introduction

1.1 Purpose of the Groundwater and Surface Water Monitoring Plan

1.1.1 This document has been prepared to provide a summary of the monitoring points in HS2 Area South that require baseline (pre-construction) monitoring by Costain Skanska Joint Venture (CSJV), as required by the Environment Agency, under the Surveys Work Package (WP16).

1.2 Monitoring Context for Area South

1.2.2 The requirement for water monitoring is stipulated by the "High Speed Rail (London-West Midlands) Environmental Minimum Requirements Annex 1: Code of Construction Practice" (CoCP). More detail is provided on the drivers for the monitoring in **Section 2**.

1.2.3 This Monitoring Plan relates to monitoring to be undertaken at groundwater and surface water monitoring points in Area South, Sector 2 (S2 – Northolt Tunnels – Chainage 9+505 to 25+ 800) only. For more information on the water monitoring points covered by the Work Package, see **Section 3.**

1.2.4 Whilst this document covers the work being undertaken under the Enabling Works Contract (EWC), where relevant signposts have been added to refer to separate monitoring activities being undertaken by the Main Works Civils Contractor (MWCC) in Area South.

1.3 Water Monitoring Types

1.3.5 The types of potentially applicable water monitoring identified from the requirements of the CoCP are outlined in **Table 1** according to the type of project activity, the section of HS2 route in Area South, the aspect of design and the HS2 Contract Management Organisation (CMO) responsible.

Table 1 Types of water monitoring needed in Area South and their associations with design aspects.

Water Type	Monitoring type	Activity having an effect	HS2 Route/Design Aspect (EWC/MWCC)
Surface water	Quality	Construction/incident	Above ground (EWC)
	Flow	Abstraction, impoundment, discharge to watercourse.	Above ground (MWCC)

Water Type	Monitoring type	Activity having an effect	HS2 Route/Design Aspect (EWC/MWCC)
		Dewatering, discharge to watercourse.	Tunnel, shaft, portal (MWCC).
Groundwater	Quality	Sustainable placement of tunnel arisings, piling.	Copthall Cutting (Sector 2) (MWCC).
	Level	Dewatering, discharge to ground, piling.	Tunnel, shaft, portal (MWCC).

1.3.6 Groundwater monitoring of the Principal Aquifer (Chalk) is already being undertaken for Sector 2 as part of the HS2 MWCC, covering both groundwater levels and quality as a baseline for the tunnel and cutting excavation works. East of the Copthall Cutting, the route is principally designed within the London Clay aquiclude, so tunnelling and shaft excavation is unlikely to impact aquifer groundwater resources. No further monitoring of groundwater is considered to be necessary in Sectors 1-3, in accordance with the requirements of the CoCP. This work is now being undertaken and managed by the MWCC, Skanska Costain Strabag Railways (SCS), so is not part of the scope of CSJV's work and will not be discussed in this document.

1.3.7 Being within the district of the city of London, much of Area South comprises urban areas in Sectors 1, 3 and 4, in which watercourses have historically been culverted and built over, or incorporated into urban sewer systems. However, a number of watercourses can still be identified along the HS2 Route, which are listed in **Table 2,** together with their position along the route (chainage) and whether the HS2 Route is in a tunnel or above ground (see **Annex 1** for screenshots of the crossing points).

Table 2 Watercourse crossings made by the HS2 Route in Area South

ID	Watercourse	Chainage	Route in tunnel/above ground
1	Grand Union Canal	1830	Tunnel
2	Grand Union Canal	7850	Tunnel
3	River Brent	13125	Tunnel
4	??? - south side	14450	Tunnel
5	Culverted stream	16240	Tunnel

ID	Watercourse	Chainage	Route in tunnel/above ground
6	Grand Union Canal	17120	Tunnel
7	The Roxbourne (culverted)	19740	Tunnel
8	Yeading Brook (culverted on crossing)	21340	Tunnel
9	Ickenham Stream	23800	Portal
10	River Pinn	24490	Above ground
11	Newyears Green Bourne	N/A	Above ground (Harvill Road upgrade)

1.3.8 Eight out of 11 watercourses identified in **Table 2** cross the HS2 Route in Sectors 1-3 whilst it is hydraulically isolated in a tunnel within the London Clay.

1.3.9 In Sector 2, there are three watercourses that are crossed by the above ground HS2 route that can potentially be affected by the construction works, therefore require pre-construction monitoring. Going from east to west, these are as follows:

- Ickenham Stream;
- River Pinn; and
- Newyears Green Bourne (monitored by Main Works Contract undertaker, but only in the headwaters at Newyears Green).

1.4 Hydrological Setting

1.4.10 There are a number of watercourses in Area South that cross the HS2 route (**Section 1.2**). In the above ground part of the Area South route. These include the River Pinn, the Ickenham Stream and the Newyears Green Bourne, and their tributaries.

1.4.11 The Newyears Green Bourne is a main river that flows in a south-westerly direction from the village of Newyears Green to the Colne Valley, crossing Harvill Road – the western boundary of Area South. Its channel from Newyears Green Lane to Harvill Road (between monitoring points ML025-SW200 and ML025-SW201) has a shallow bed level gradient and has a flood zone 2 and flood zone 3 associated with it.

1.4.12 The River Pinn in a main river that flows from north to south across the Chiltern Main Line (CML) from Ruislip to Ickenham. The River Pinn floods seasonally and has a flood zones delineated with it.

1.4.13 The Ickenham Stream has two parts. The main river section extends from the CML south into the River Crane catchment. North of the CML, the Ickenham Stream is a northward and north-westward flowing ordinary watercourse within the West Ruislip Golf Course, that forms a tributary of the River Pinn. The Ickenham Stream does not have river flood zones but is prone to surface water (pluvial) flooding. The surface water flooding area follows the tributary of the north-westward flowing tributary of the River Pinn from the golf course.

1.5 Rationale for the Monitoring Planned for Area South

1.5.14 The EWC works in Sector 2 involve demolition, vegetation clearance and construction of temporary infrastructure (e.g. haul roads, drainage, temporary bridges). With reference to **Table 1**, none of these activities involve abstraction, discharges or impoundment of water that would require a consent. Therefore, due to the nature of these activities, surface water flow monitoring would not be required. Only surface water quality monitoring is proposed on the three watercourses in Area South Sector 2.

1.6 Overview of Work Package Activities

1.6.15 Under the Work Package (WP16), surface water quality monitoring should be undertaken at 11 monitoring points in Sector 2. The locations of these are illustrated in **Figure 1** but breakdown across hydrological catchments as follows:

- 8 are surface water monitoring points in the River Pinn and Ickenham Stream (ordinary watercourse) catchments;
- 1 is a surface water monitoring point in the Ickenham Stream (main river) catchment; and
- 2 are surface water monitoring points located in the Newyears Green Bourne catchment.

1.6.16 More detail will be provided on specific monitoring activities in **Section 3**.

1.7 Programme

1.7.17 The programme for the water monitoring under the Surveys Work Package (WP16) will start in May 2019 and continue for 12 months to April 2020, at a monthly monitoring frequency.

1.8 Roles and Responsibilities

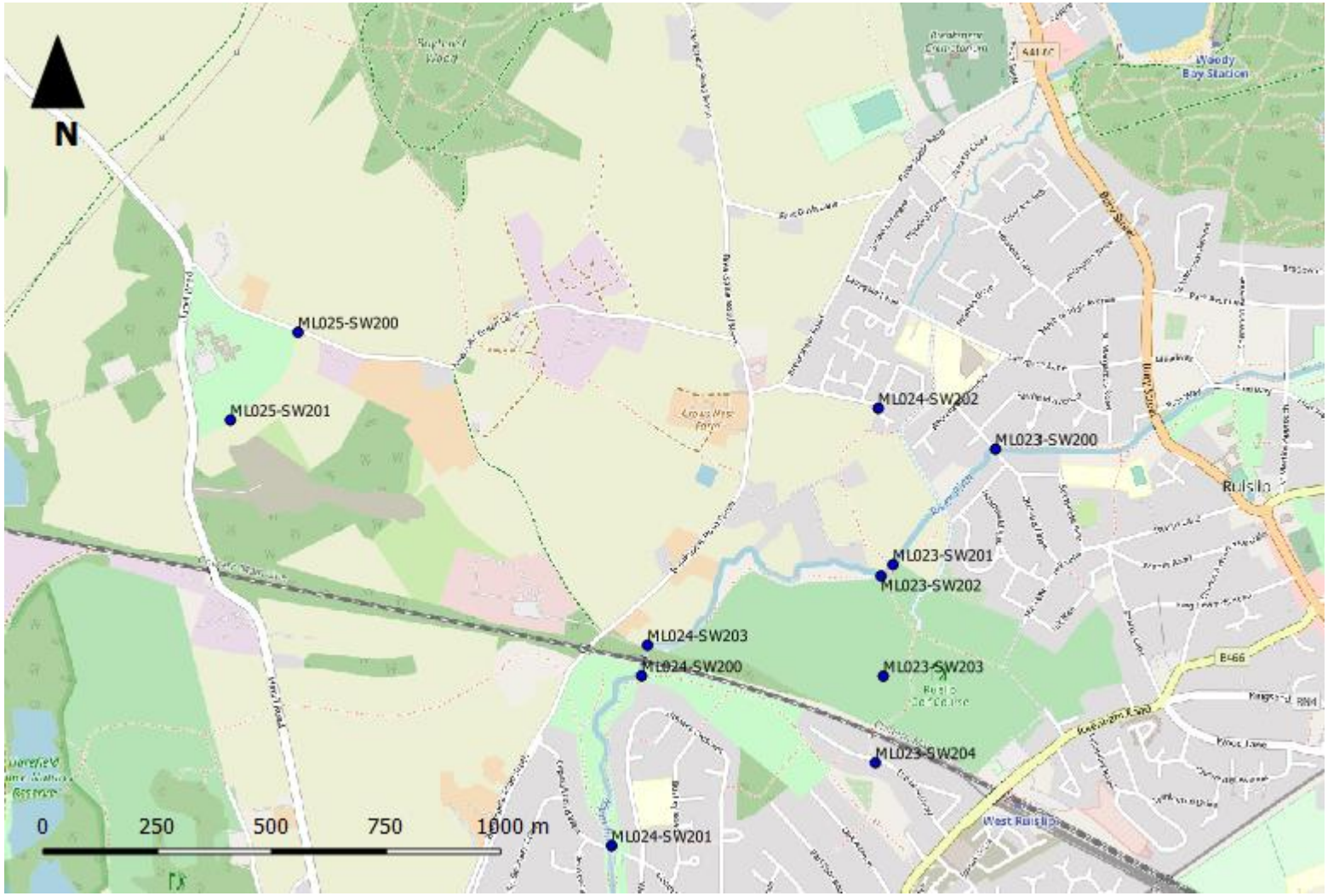
1.8.18 Following the baseline and water monitoring undertaken during the Environmental Statement (ES), further baseline and pre-commencement monitoring is required to demonstrate that no adverse impact on the water environment and flood risk has resulted from the HS2 route construction. This CSJV Work Package provides the 12-month period of baseline surface water quality monitoring.

1.8.19 The roles and responsibilities of the water monitoring under the Work Package are specified in **Table 3.** CSJV provides the role of CMO. The Work Package Contractor refers to the monitoring contractor who is appointed under the Work Package.

Table 3 Roles and Responsibilities during the pre-construction water monitoring to be delivered under the Surveys Work Package.

CMO	Work Package Contractor	Specialist Water Monitoring Contractor
• Assurance of the monitoring data following submission by the Work Package Contractor. • Lead data assurance meetings that may be required with the Work Package Contractor. • Submission of monitoring data to HS2 and Environment Agency. • Lead consultation meetings with the EA/HS2 to present the monitoring data as required by the EA/HS2.	• There are no non-specialist contractors appointed.	• Undertake 12 months of pre-construction monitoring at surface water monitoring points. • Carry out validation checks on the data to ensure that there are no quality control issues prior to submission to the CMO. • Attend data assurance meetings as required by the CMO. • Attend consultation meetings with the EA/HS2 as required by the CMO.

Figure 1 Surface Water Monitoring Points in Ickenham, West Ruislip and Newyears Green Bourne



2 Drivers and Standards for Surface Water Monitoring

2.1 HS2 Environmental Statement

2.1.20 The Environmental Statement for HS2 is accompanied by a Code of Construction Practice (CoCP)[1], which outlines the Environmental Minimum Requirements for HS2. For Water Resources, "the nominated undertaker will require its contractors to consult the Environment Agency regarding water quality, flow and level monitoring to be undertaken for watercourses and groundwater that will be affected by construction works or the discharge of surface water run-off".

2.1.21 The CoCP states that where it is appropriate, this monitoring should include:

- Pre-construction monitoring to establish baseline water quality conditions;
- Monitoring during construction works to enable the effectiveness of mitigation measures to limit pollution risk and any detectable pollution incidents to be identified; and
- Monitoring of watercourses or groundwater receiving surface water run-off during construction to enable the effectiveness of treatment and other sustainable drainage systems (SuDS) measures to be determined and to ensure that an unacceptable rise in groundwater levels does not occur.

2.1.22 This requirement is reflected in the High Speed Two Phase One Information Paper E4: Water Resources and Flood Risk (**Section 6**).

2.2 WRFR Management Plan

2.2.23 The Water Resources & Flood Risk (WRFR) Management Plan details how CSjv and its supply chain will deliver the water resources and flood risk management requirements of the HS2 Area South EWC. An overview of legislation, both dis-applied and standing legislation following the HS2 Act, is provided in the WRFR Management Plan. Relevant items of legislation that were not disapplied by the Act are also outlined in the WRFR Management Plan and include the Water Resources Act (1991) which, under Section 85, makes it an offence to pollute controlled waters by discharging any substance other than permitted discharges of sewage or trade effluent to controlled waters.

[1] High Speed Rail (London-West Midlands) Environmental Minimum Requirements, Annex 1: Code of Construction Practice, February 2017. Section 16.4 (p83).

2.2.24 Overall roles and responsibilities of Water Resources & Flood Risk in CSjv Environment Team are detailed in the WRFR Management Plan and summarised in Section below.

2.3 Water Framework Directive Compliance Assessment

2.3.25 The Water Framework Directive (WFD) requires the monitoring and classification of water bodies and a compliance assessment for the construction of the HS2 route is provided in the Technical Standard - Water Framework Directive Compliance Process (HS2-HS2-EV-STD-000-000012).

2.3.26 Volume 5 of the ES contains the Technical Appendix for Water Resources, which contains the Water Framework Directive Compliance Assessment (WFDCA). This specifies the requirement for baseline monitoring of surface water in the pre-construction phase in accordance with the CoCP.

2.3.27 The WFDCA requires that the monitoring undertaker consult the EA when undertaking pre-construction monitoring.

2.4 Local Environmental Management Plans (LEMP)

2.4.28 In the Hillingdon LEMP, Hillingdon Borough Council state that a 'programme of groundwater and surface water monitoring will be undertaken prior to, during and following completion of the construction works. The monitoring programme scope and duration will be developed and agreed with the Environment Agency'.

2.5 Relevant HS2 Technical Standards

2.5.29 Due to the size and nature of the project, HS2 Ltd have produced a series of technical standards in close consultation with the regulators. These aim to:

- Produce a common assessment and design procedure; and
- Provide minimum acceptable standards, to help ensure that designs and assessments are acceptable by HS2 Ltd and approving authorities.

2.5.30 Relevant technical standards include Water Resources and Flood Risk Monitoring Technical Standard (HS2-HS2-EV-STD-000-000029) and Water Resources and Flood Risk Consenting (HS2-HS2-EV-STD-000-000015). Also relevant to the water monitoring is the Schedule 1 Specification for Ground Investigation (HS2-HS2-GT-SPE-000-000001), which specifies the analytical suites for water quality samples.

2.5.31 The Water Resources and Flood Risk Monitoring Technical Standard provides a set of high-level principles to inform consistent route-wide monitoring during the baseline, pre-construction, construction and post-construction phases. General principles relating to surface water monitoring activities include ensuring all monitoring equipment is calibrated according to the

manufacturer's instructions. A data management system, agreed between the key parties, is required to manage the large amounts of monitoring data collected. The data shall be validated and reported to HS2 Ltd, reporting expectations shall be agreed with HS2 Ltd.

2.6 Supporting Documents

2.6.32 The Area South Environment Management Plan (EMP) (1EW02-CSJ-EV-PLN-S000-000001) and Work Package EMP should be referred to for information regarding environmental protection of the water environment during site visits and site specific issues that need to be taken into account by both the appointed monitoring contractor and the CMO during site visits.

3 Surface Water Monitoring Network Design

3.1 Introduction

3.1.33 This section presents the design of the monitoring network, covering monitoring point locations, monitoring frequencies and choice of chemical parameters.

3.2 Proposed Monitoring Locations

3.2.34 Monitoring will be undertaken at 11 monitoring points, for which the locations are illustrated in **Figure 1** and coordinates are listed in **Table 4**.

Table 4 Surface water quality monitoring point locations in Sector 2.

Location ID	Easting	Northing	Elevation (mAOD)	Reason for inclusion
ML023-SW200	508334.64	187779.39	35	River Pinn. Monitoring upstream of HS2 works. To be removed as located 400m upstream of nearest HS2 works at Ruislip Golf Course and 8 months of monitoring data already collected.
ML023-SW201	508052.70	187448.71	40	River Pinn, downstream of tributary issuing from culvert at Glovers Grove. Immediately upstream of a tributary of the River Pinn which runs through the Ruislip Golf Course.
ML023-SW202	508019.77	187416.23	41	Tributary of the River Pinn, which runs through Ruislip Golf Course.
ML023-SW203	508032.33	187134.76	46	Ickenham Stream (northward flowing channel, Pinn catchment) – Drain channel within Ruislip Golf Course. Accepts drainage from the South-East section of the golf course heading northward.
ML023-SW204	508015.29	186891.00	45	Ickenham Stream – head of southward flowing channel draining to the Crane catchment and south of HS2 Scheme.
ML024-SW200	507351.38	187120.87	24	River Pinn: Immediately downstream of HS2 works at Ruislip Embankment.

Location ID	Easting	Northing	Elevation (mAOD)	Reason for inclusion
ML024-SW201	507277.39	186641.99	40	River Pinn: Approximately 500m downstream of HS2 works at Ruislip Embankment. To be removed as there are no tributaries between this monitoring point and the upstream monitoring point ML024-SW200. Eight months of monitoring data has already been collected here.
ML024-SW202	508001.85	187887.02	40	Unnamed Tributary of River Pinn issuing from culvert at Glovers Grove. Monitoring upstream of HS2 works. To be removed as it is 450m upstream of nearest HS2 works at Ruislip Golf Course. Eight months of monitoring data already collected here.
ML024-SW203	507366.27	187207.83	38	River Pinn: Immediately, upstream of HS2 works at Ruislip Embankment.
ML025-SW200	506363.45	188065.96	-	Newyears Green Bourne: Affected by surface run off from a scrap yard – baseline being collected to characterise off-site/non-HS2 source of pollution. Has potential for contamination from the scrap yard and has shown elevated concentrations of metals and EPH so far.
ML025-SW201	506178.19	187815.38	50	Newyears Green Bourne: Upstream of Copthall Cutting, Harvill Road Bridge and downstream from the scrap yard.

3.3 Monitoring Frequency

3.3.35 The surface water quality monitoring rounds will be undertaken monthly for 12 months.

3.4 Chemical Parameters

In situ measurements

3.4.36 There are five physico-chemical parameters that will be measured on-site for every sample, which are as follows:

- Temperature (°C, accurate to 0.1°C);
- pH (accurate to 0.1pH units);
- Electrical Conductivity (accurate to 10µS/cm);

- Dissolved Oxygen (mg/l and %saturation, accuracy to within 2%sat or 0.1mg/l); and
- Redox Potential (mV).

Analytical parameters

3.4.37 The proposed analytical parameters for surface water sampling in Sector 2, based on the most likely pollutants likely to result from construction activities and the need to characterise the water quality baseline, are as follows:

- Suspended solids;
- Hydrocarbons;
- Major ions;
- Redox sensitive metals; and
- Heavy metals.

3.4.38 HS2 Suite I (**Table 5**) and Iron and Manganese have been selected on a risk basis to cover the main parameter groups listed above.

Table 5 SUITE I – Surface water samples (Source: Schedule 1: Specification for Ground Investigation HS2-HS2-GT-SPE-000-000001, adjusted based on professional judgement and LODs achieved by laboratory)

Parameter	Limit of detection (LOD)	Accreditation required
BTEX Compounds	5 µg/l	UKAS
MTBE[1]	5 µg/l	UKAS
Total petroleum hydrocarbons (GRO, EPH)	10 µg/l	UKAS
Phenol (total monohydric)	150 µg/l	UKAS
Aluminium (dissolved)[1,2]	1.5 µg/l	UKAS
Arsenic (dissolved)	0.9 µg/l	UKAS
Barium (dissolved)	1.8 µg/l	UKAS
Beryllium (dissolved)	0.5 µg/l	UKAS
Boron (dissolved)	12 µg/l	UKAS
Cadmium (dissolved)	0.03 µg/l	UKAS

Parameter	Limit of detection (LOD)	Accreditation required
Chromium III (dissolved)	6 µg/l	UKAS
Chromium VI (dissolved)	6 µg/l	UKAS
Copper (dissolved)	1 µg/l	UKAS
Cyanide (total)	10 µg/l	UKAS
Lead (dissolved)	0.1 µg/l	UKAS
Mercury (dissolved)	0.01 µg/l	UKAS
Nickel (dissolved)	0.2 µg/l	UKAS
Selenium (dissolved)	1.2 µg/l	UKAS
Vanadium (dissolved)	0.6 µg/l	UKAS
Zinc (dissolved)	1.5 µg/l	UKAS
pH	+/- 0.01 units	UKAS
Specific electrical conductivity	2 µS/cm	UKAS
Total dissolved solids (TDS)	35 mg/l	UKAS
Total suspended solids (TSS)	10 mg/l	UKAS
Total organic carbon (TOC)	2 mg/l	UKAS
Hardness	10 mg/l	UKAS
Major ions (Ca, Mg, Na, K, Cl, SO_4, bicarbonate[1], carbonate[1])	Various (0.2, 0.1, 0.1, 0.3, 0.5 mg/l and 1 mg/l as $CaCO_3$/1 mg/l as $CaCO_3$)	UKAS
Nitrogen species (Total N, NO_3-N, NO_2-N, NH_4-N)	Various (0.5, 0.05, 0.006, 0.003 mg/l)	UKAS
Total P, Orthophosphate PO_4-P	Various (0.005, 0.03 mg/l)	UKAS

[1] Additional parameters selected that were not in **HS2-HS2-GT-SPE-000-000001**.

[2] Included to aid the detection of concrete leachate pollution.

Table 6 Iron and Manganese (total and dissolved) – Surface water Samples

Parameter	Limit of detection	Accreditation required
Iron (total)	20 µg/l	UKAS
Iron (dissolved)	20 µg/l	UKAS
Manganese (total)	2 µg/l	UKAS
Manganese (dissolved)	2 µg/l	UKAS

4 Surface Water Monitoring Methodology

4.1 Introduction

4.1.39 This section summarises the surface water monitoring that will be undertaken as part of the Surveys Work Package (WP16) managed by CSJV.

4.1.40 The surface water sampling methodology includes the following activities:

- Monitoring Point and Sample Observations;
- Physico-chemical Measurements;
- Collecting Surface Water Quality Samples;
- Laboratory Analysis;
- Quality Control Procedures for Monitoring.

4.2 Monitoring Point and Sample Observations

4.2.41 At each monitoring point, all field observations and measurements will be recorded on a Monitoring Record Sheet. The Monitoring Record Sheet will record the monitoring point, date and time the monitoring was undertaken, description of the appearance of the sample (covering colour, opaqueness/transparency, any cloudiness, presence of suspended sediment or other material, smell if there is a smell, and weather conditions. The Monitoring Record Sheet need to be collated and provided as a project deliverable together with the spreadsheet.

4.3 Physico-chemical Measurements

4.3.42 Physico-chemical parameters (pH, temperature, Electrical Conductivity and Dissolved Oxygen) will be measured in the field using a water quality multi-meter. The multi-meter sensor should be lowered or placed directly into the flowing part of the watercourse or pumped through a flow cell to take the measurements. The order of parameter stabilization is pH > temperature > Electrical Conductivity > Dissolved Oxygen (DO), so physico-chemical measurements should only be recorded and a sample should only be taken once DO has stabilized to within 10% of its value for three consecutive readings. Manual records will be recorded on the Monitoring Record Sheet and electronically on the hand-held multimeter, for later download.

4.4 Collecting Surface Water Quality Samples

4.4.43 The surface water sample will be taken using the bottle types provided in accordance with the parameters being sampled, following all procedures with respect to pre-treatment (e.g.

filtration) and sample preservation (as specified by the accredited laboratory), and taking all measures to prevent sample contamination (e.g. wearing sampling gloves whenever a sample is being collected and replacing gloves between samples).

4.4.44 The will be stored in cool boxes containing ice blocks to keep the samples at approximately 4°C. Samples will be transported to the laboratory quickly and safely by courier following the end of each day's monitoring round.

4.4.45 Quality control procedures will be carried out as described in **Section 4.6.**

4.5 Laboratory Analysis

4.5.46 The parameters required to be monitored at each surface water monitoring point under the Survey Work Package contract are summarised in the following suites (listed in full in **Section 3.4**) include:

- Suite I – Laboratory physico-chemical parameters, major ions, nutrients (nitrogen and phosphorus species), heavy metals and metalloids, Total Petroleum Hydrocarbons (TPH), total BTEX compounds, Phenol (total monohydric), TDS, TSS, TOC and hardness2; and
- Iron and manganese (total and dissolved).

4.5.47 The level of detection (LOD), which describes the analytical precision for each parameter is specified in **Table 5**.

4.5.48 In addition, temperature, pH, Electrical Conductivity and Dissolved Oxygen should also be measured in the field at every monitoring point (see **Section 3.4**).

4.5.49 Temperature of the samples will be checked upon receipt at the laboratory and recorded to demonstrate that the samples had been transferred in refrigerated conditions (cool boxes containing ice blocks).

4.5.50 The laboratory analysis for each sample will be completed within 10 working days.

4.6 Quality Control Procedures for Monitoring

4.6.51 Best practice monitoring should include provisions for quality control procedures to be built into the design of the monitoring. The purpose of these procedures is to provide confidence that the monitoring has delivered high quality data that is suitable as baseline data against which any future environmental impact can be adequately assessed.

4.6.52 Quality control procedures are designed to check the effectiveness and reproducibility of the monitoring, sampling process and laboratory analytical procedures. Such procedures also help

[2] TDS, TSS, TOC – Total Dissolved Solids, Total Suspended Solids and Total Organic Carbon.

to demonstrate that correct sampling techniques have excluded the possibility of sample contamination occurring. Any exceptional results from the quality control sampling will be investigated and repeat analysis undertaken where necessary.

4.6.53 For the purposes of the surface water quality sampling to be undertaken under the Survey Work Package, three main quality control procedures will be undertaken in addition to those described for physico-chemical parameters:

- Ionic balance – for every sample, an ionic balance should be calculated to assess the level of precision and confidence in the major ion analyses. The sum of the chemical activities for the cation should equal those of the anions to within 10% (as a minimum requirement);
- Field blanks – these are samples prepared in the field using laboratory grade de-ionised water, which are analysed in the laboratory to demonstrate that no sampling contamination occurs on the monitoring round; and
- Split duplicate samples – these are surface water samples that are prepared in the field by splitting one well mixed sample into two sample bottles for analysis. The purpose of this is to demonstrate the degree of precision delivered by the laboratory analysis for all parameters monitored at a given location.

4.6.54 The monitoring will include 10% quality assurance samples to be collected as part of the best practice approach in water sampling. Analytical results from these quality assurance samples will be checked by the appointed monitoring contractor.

4.6.55 Field measurements of pH and Electrical Conductivity require validation in the laboratory. If there is a marked difference between the field and laboratory measurements of pH and conductivity, this will be investigated for the source of the difference.

4.7 Reporting Requirements

4.7.56 The results of the water monitoring will be provided on a monthly basis to the CMO for review and quality control (see Appendix 1). At the end of the Surveys Work Package Contract, a factual report will be provided. It is anticipated that this will become a publicly available document.

4.7.57 The report will contain information on any concentrations of pollutants that exceed the Environmental Quality Standards.

5 Requirements for Commencement

5.1 Health and Safety

5.1.58 A Risk Assessment and Method Statement (RAMS) will be produced by the Water Monitoring Contractor during the initial site visits with the CSJV Water Resources and Flood Risk Specialist. This will include information gathered from the initial site visit on site information sheets. Each monitoring point will have its own location and access map and site-specific risk assessment. The RAMS will be reviewed by CSJV for approval prior to the work commencing.

5.1.59 As the work includes working above or adjacent to water, the sampling will be double-manned, and PPE will include a life jacket worn and throw line.

5.1.60 During the initial site visit to the original location of monitoring point ML025-SW201 on the Newyears Green Bourne, a protestor approached the CSJV group and displayed low-level intimidating behaviour. The monitoring point location was moved to HS2-owned land. In future, a CSJV security guard will be present for the Newyears Green Bourne part of the monitoring round as a safety measure.

5.2 Training and Awareness

5.2.61 A Specialist Water Monitoring Contractor has been commissioned to undertake the surface water monitoring, precluding the need for intensive training of samplers.

5.2.62 No additional training by the CMO is envisaged.

5.3 Land Access

5.3.63 Land access arrangements for all project activities will be made according to the Technical Standard - HS2 Accesses (HS2-HS2-HW-STD-000-000003).

5.4 Consent Requirements

5.4.64 There are no known consent requirements for the monitoring activities, other than land access consents.

5.5 Inspections and Audits

5.5.65 To ensure compliance with the Area South EWC assurance process and Technical Assurance Plan (TAP), quality assurance measures will be undertaken by the CMO. These will include audits of the monitoring activities to check that the methodology complies with the Technical

Standard for Water Resources and Flood Risk Monitoring (HS2-HS2-EV-STD-000-000029) and the Specification for the monitoring laid out in the Work Package Plan.

5.5.66 The need for site inspections will be specified for each work package within the work package Environmental Management Plan (EMP). The combined level of risk (activity risk x vulnerability of the site) will determine the inspection frequencies required by the EMP. It is proposed that six-monthly monitoring inspections and EMR checks will be carried out by the CMO WRFR Specialist.

5.6 Data Quality Control

5.6.67 The CMO will undertake periodic inspections of monitoring activities to ensure that methodological requirements and water protection requirements outlined in the technical standards are adhered to. The results of these inspections will be recorded in a standard proforma to be uploaded onto eB for archiving by the CMO. The results of the December 2019 monitoring inspection are detailed in 1EW02-CSJ-AU-REP-S002-000014.

5.6.68 Initial quality control of the monitoring data (as outlined in **Section 4.6.53**) will be undertaken by the Specialist Water Monitoring Contractor prior to submission to the CMO for review as self-assurance. It will be the requirement of the appointed contractor to identify common quality control problems and report these to the CMO for discussion. Any issues with the data will be discussed in a monthly data review meeting (teleconference) and repeat analysis will be undertaken, if necessary, to ensure a high-quality data set is provided.

5.6.69 The monitoring data will then be finalised and re-issued in a one-row-per record spreadsheet format to allow efficient database upload and enable the Environment Agency to upload the data to their water quality archive, the Water Information Management System (WIMS).

5.7 Consultation Requirements

5.7.70 CSJV, and where appropriate the Specialist Water Monitoring Contractor, will undertake early engagement with the Environment Agency on water monitoring required by the CoCP, in accordance with the requirements of the Water Framework Directive Compliance Assessment Technical Standard.

5.7.71 HS2 and the Environment Agency were consulted in a meeting on 21-01-2020 on the monitoring points and the water quality monitoring methodology presented in this monitoring plan. No comments were received on the methodology. However, HS2 and the Environment Agency stated that monitoring at the following monitoring points could be discontinued because these represent monitoring in excess of the HS2 minimum requirements for monitoring point locations, which has collected a sufficient baseline for the upstream and downstream extremes of the Sector 2 watercourses that are crossed by the HS2 Route:

- ML023-SW200;

- ML024-SW201; and
- ML024-SW202.

Appendix 1 Quality Control Reports

The following table lists monthly quality control reports produced for the baseline monitoring, in accordance with requirements outlined in **Sections 4.6** and **4.7.**

Monitoring Round	Document Number
June 2019	1EW02-CSJ-GL-REP-S002-000053
July 2019	1EW02-CSJ-GL-REP-S002-000054
August 2019	1EW02-CSJ-GL-REP-S002-000055
September 2019	1EW02-CSJ-GL-REP-S002-000056
October 2019	1EW02-CSJ-GL-REP-S002-000057
November 2019	1EW02-CSJ-GL-REP-S002-000058
December 2019	1EW02-CSJ-GL-REP-S002-000059
January 2020	1EW02-CSJ-GL-REP-S002-000060
February 2020	1EW02-CSJ-GL-REP-S002-000061
March 2020	1EW02-CSJ-GL-REP-S002-000062
April 2020	1EW02-CSJ-GL-REP-S002-000063
May 2020	1EW02-CSJ-GL-REP-S002-000064