

# Hampshire Water Transfer and Water Recycling Project

## Environmental Statement – Appendix 19.9 Outline Water Monitoring Plan

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The Southern Water logo consists of three stylized, wavy blue lines of varying lengths, positioned to the right of the text 'Southern Water'.



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# 1 Introduction

## 1.1 Background

- 1.1.1 This Outline Water Monitoring Plan (WMP) has been prepared on behalf of the Applicant, for the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as the 'Proposed Development').
- 1.1.2 Due to the sensitivity of the water environment in the study area (as defined in section 19.5 of Environmental Statement (ES) Chapter 19 Water environment, Volume I, (Document reference 6.1, DCO Volume 6)), it is identified that monitoring is required to be undertaken prior to, during and post-construction to monitor local hydrological and hydrogeological behaviour (both water quantity and water quality), across the Proposed Development. The monitoring is intended to assist in the verification of potential impacts arising, including those predicted impacts of the Proposed Development on surface water and groundwater receptors (as set out in section 19.8 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6)), and identify when supplementary mitigation requirements may need to be implemented beyond those delivered as part of the Proposed Development.
- 1.1.3 The Outline WMP describes the monitoring strategy, with an updated WMP to be developed post-consent and to be agreed before works commence.
- 1.1.4 This Outline WMP has been shared with the Environment Agency (EA) and Portsmouth Water for comment, with their recommended updates on monitoring incorporated.
- 1.1.5 Implementation of the WMP, including pre-construction, construction and post-construction monitoring requirements, will be the responsibility of the Contractor.
- 1.1.6 The WMP will be dynamically reviewed in line with the encountered surface water, ground and groundwater conditions, with the requirement for additional, or changes to, monitoring agreed where:
1. Unforeseen surface water, ground or groundwater conditions are encountered; or.
  2. Amber or Red trigger level thresholds are met (see section 4.6).
- 1.1.7 This Outline WMP does not cover monitoring requirements in relation to the Proposed Development's potable or non-potable water supplies or discharges (both during construction and operation), which will be captured by the relevant consents with stakeholders.
- 1.1.8 A summary of the anticipated monitoring requirements, informed by the Environmental Impact Assessment (EIA) and stakeholder engagement, is outlined in Table 4-1.

## 1.2 License and permit requirements

- 1.2.1 This Outline WMP sets out the monitoring principles to be adopted when developing the detailed WMP.

- 1.2.2 The monitoring outlined within the strategy is not an exhaustive list of monitoring requirements and additional monitoring may be required; including monitoring to be undertaken to comply with protective provisions or abstraction licenses and environmental permits. Where the monitoring strategy does not align with the requirements outlined by protective provisions or a regulatory permit, the protective provisions and regulatory permit requirements will take precedence (i.e. the monitoring strategy outlined here will be superseded by the legislative requirements).

## 2 Baseline

### 2.1 Surface water

#### Site investigation

2.1.1 The following site investigations have been undertaken to support the assessment of the water environment:

1. A geomorphological walkover survey was undertaken, between 26 September 2023 and 29 September 2023, in Main Rivers where crossings are proposed to identify channel form (including planform, width and depth variation, bank form and condition, substrate types and the type and presence of bed forms such as pools, riffles and bars), flow conditions (including dominant flow types and the degree of variability within each reach), floodplain characteristics (including connectivity to the river channel, and the structure of the riparian zone), in-channel/riparian vegetation, and evidence of channel modification (including enlargement and re-sectioning, artificial bank protection, embankments and in-channel structures). Results of the survey have been used to inform the baseline characterisation presented in section 19.7 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6).
2. Surface water quality monitoring has been undertaken to improve the baseline characterisation of water quality in Riders Lane Stream and Hermitage Stream. Samples were collected at six locations on a monthly basis between November 2024 and October 2025. The results of the monitoring are summarised in section 19.7 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6). This monitoring encompassed a range of basic water quality parameters, including:
  - a. Temperature, pH, conductivity, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Dissolved Organic Carbon (DOC), alkalinity and turbidity.
  - b. Total Phosphorus (TP), phosphate and reactive orthophosphate.
  - c. Total Nitrogen (TN), Dissolved Inorganic Nitrogen (DIN), ammoniacal nitrogen, ammonium, nitrate and nitrite.
3. A water features survey of identified groundwater related features including licenced and unlicenced abstractions, springs and groundwater dependent watercourses and terrestrial ecosystems has been undertaken. The outputs of this survey are presented and discussed in ES Appendix 19.3 Hydrogeological Impact Assessment, Volume II (Document reference 6.2, DCO Volume 6) and have been used to inform the baseline characterisation presented in section 19.7 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6). Further details on potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) are discussed in ES Chapter 8 Terrestrial and freshwater biodiversity, Volume I (Document reference 6.1, DCO Volume 6).

## Regional and local third-party data

- 2.1.2 In addition to the site-specific investigations, regional and local third party hydrological and water quality data has been used to characterise the baseline in section 19.7 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6). Data from the EA, Defra map application – Multi Agency Government Information for the Countryside (MAGIC), the Applicant, Portsmouth Water, Lead Local Flood Authorities and the British Geological Society have been used.
- 2.1.3 The regional understanding is summarised in section 19.7 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6).
- 2.1.4 Third party data will be reviewed, with updated data obtained, prior to commencement of monitoring.

## 2.2 Groundwater

### Ground investigation

- 2.2.1 Ground investigation to support the design of the Proposed Development and EIA has been conducted in several phases termed Phase 0, Phase 1, Phase 2, Phase 3A, Phase 3B and Phase 3C (see ES Figure 19.3 Completed ground investigation, Volume III (Document reference 6.3, DCO Volume 6)).
- 2.2.2 The ground investigation results relevant to hydrogeology are summarised in ES Chapter 11 Land quality and ground conditions, Volume I (Document reference 6.1, DCO Volume 6) and ES Appendix 19.3 Hydrogeological Impact Assessment, Volume II (Document reference 6.2, DCO Volume 6).
- 2.2.3 Annex A of this Outline WMP summarises the monitoring installations installed previously as part of the Proposed Development, together with groundwater level data that has been utilised to date. It is noted that the majority of installations have been decommissioned due to planning or access constraints, and as such will not be available for future monitoring.

### Regional data

- 2.2.4 In addition to the site-specific ground investigation data, regional and local hydrogeological data has been obtained from third parties including the EA, Portsmouth Water and the British Geological Society. Data has also been collated from the Applicant's public water supply at Otterbourne.
- 2.2.5 The regional understanding is summarised in ES Appendix 19.3 Hydrogeological Impact Assessment, Volume II, (Document reference 6.2, DCO Volume 6).
- 2.2.6 Third party data will be reviewed, with updated data obtained, prior to commencement of monitoring.

## 3 Monitoring methodology

### 3.1 Introduction

- 3.1.1 This section outlines the general overarching requirements and methodologies to be implemented during the monitoring works, whilst section 4 outlines the monitoring strategy (durations, locations and site-specific requirements).
- 3.1.2 Where alternative measures to those identified within the Outline WMP are proposed to be utilised, these will be agreed with the EA and Portsmouth Water and be of equal (or better) efficacy.

### 3.2 General requirements

- 3.2.1 Prior to any monitoring works commencing, the monitoring plan will be developed and agreed with key stakeholders (the EA and Portsmouth Water).
- 3.2.2 The WMP will detail a Communications Plan with relevant parties. Primary, secondary and tertiary<sup>1</sup> contacts (where feasible) will be identified to enable action plans (see section 4.6) to be implemented in a timely manner. Relevant parties include:
1. Applicant's Project Team
  2. Contractor
  3. Environment Agency
  4. Natural England (NE) (in relation to designated sites)
  5. Portsmouth Water Operation Team (at Bedhampton and Farlington)
  6. Applicant's Operation Team (at Otterbourne)
  7. Relevant water supply (licensed abstractions or private water supply) owners
- 3.2.3 In addition to the WMP, risk assessments and method statements (RAMS) will be prepared and agreed with key stakeholders (as per paragraph 3.2.1) for specific monitoring activities. In addition to health and safety measures and measuring methodologies, the RAMS will detail measures taken to prevent bio-security cross contamination between sampling locations and be prepared substantially in accordance with the Invasive Non-Native Species (INNS) Biosecurity Plan (Document reference 7.10, DCO Volume 7).
- 3.2.4 Any access arrangements and consents (such as flood risk activity permits) required to physically undertake monitoring activities will be obtained and in place, prior to the initial monitoring visit. All monitoring will be undertaken by staff with an appropriate level of experience and training relevant to the monitoring task being undertaken.

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<sup>1</sup> Primary contact being the first point of call, with secondary and tertiary contacts being contacted if primary contact non-responsive or unavailable.

## 3.3 Groundwater levels

### Manual hand dips

- 3.3.1 Prior to the initial visit, each monitoring location will be surveyed (ground level, easting and northing), with groundwater levels to be measured from the same point on each visit.
- 3.3.2 Groundwater levels will be collected at each identified monitoring location (as agreed with stakeholders) using a calibrated dipmeter, accurate to 1mm. Records of calibration will be maintained.
- 3.3.3 Groundwater levels from the manual hand dips will be recorded in metres below-ground level and reported in both metres below-ground level and metres Ordnance Datum.

### Data loggers

- 3.3.4 At identified locations (such as locations susceptible to tidal influence or proximal to public water supplies or licensed abstractions, as agreed with stakeholders), groundwater level data loggers will be installed to enable monitoring at more frequent intervals.
- 3.3.5 The selected data loggers will be accurate to 0.05%. Data loggers will be installed, calibrated and recalibrated periodically in accordance with the manufacturer's instructions. Records of calibration will be maintained.
- 3.3.6 Groundwater level data will be downloaded at regular intervals (unless telemetry is installed). Data will be reported in both metres below-ground level and metres Ordnance Datum. During on-site data downloads, a manual hand dip will be undertaken to enable calibration of levels. Where telemetry systems are utilised, a manual hand dip will be undertaken at least every six months, to enable calibration.
- 3.3.7 Where data loggers are installed, a barometric logger will be required in the area (within 500m) to enable compensation. The installed barometer will be installed, calibrated and recalibrated periodically in accordance with the manufacturer's instructions. The barometric logger will be set at the same download intervals as the groundwater level dataloggers.

### Observational data

- 3.3.8 Further to the quantitative field measurements above, qualitative information such as prevailing weather, pertinent observations and geo-referenced photography (where permitted) will also to be recorded during monitoring events to aid interpretation of the monitoring results.

## 3.4 Surface water levels and flows

- 3.4.1 Stage and discharge data from the EA Havant gauging station (station reference E11310) on Hermitage Stream will be downloaded at frequent intervals to contextualise water quality data associated with compensatory flows downstream of Havant Thicket Reservoir.
- 3.4.2 Surface water level and flow requirements on other watercourses will be informed by license and permit requirements, however they are likely to comprise spot

measurements by non-intrusive methodologies (i.e. methodologies that will not impact the flow profile of the watercourse such as Acoustic Doppler Current Profilers).

### 3.5 Water quality - field measurements

- 3.5.1 Water quality parameters will be collected in situ using a calibrated multiparameter water quality sonde at the identified monitoring locations (to be agreed with relevant stakeholders). Field equipment will be used as detailed in the manufacturer’s operating manuals and records of calibration will be maintained. Table 3-1 outlines the core suite of in situ determinands to be collected.
- 3.5.2 For surface waters, the same locations that have been used for baseline monitoring on Riders Lane Stream and Hermitage Stream (see section 2) will be used.
- 3.5.3 Further to the quantitative field measurements, qualitative information such as prevailing weather, pertinent observations (such as standard observations for pollution including oil sheen and turbidity) and geo-referenced photography (where permitted) is also to be recorded during monitoring events to aid interpretation of the monitoring results.

**Table 3-1 In situ water quality parameters (core suite)**

Parameter	Units	Detection limit	Accuracy
pH	pH units	- <sup>2</sup>	±0.1
Temperature	°C	- <sup>2</sup>	±0.1
Dissolved Oxygen	mg/l and %	0.1	±0.1
Electrical Conductivity	µS/cm	10	±2.0
Redox Potential	mV	±1	±0.1
Turbidity	NTU	0.1	±0.1

### 3.6 Water quality - laboratory analysis

- 3.6.1 The laboratory water quality sampling suite for both groundwater and surface water locations will comprise a series of base determinands that will provide a broad site-wide understanding of water quality in the study area and indicate potential water quality issues.
- 3.6.2 Additional determinands will be monitored at specific receptors and locations on a risk dependent basis. This may be as a result of existing catchment pressures on water quality including reasons for not achieving good (RNAG) and reasons for deterioration (RFD)<sup>3</sup>, land use or specific stakeholder concerns.
- 3.6.3 An indicative water quality monitoring suite is outlined in Table 3-2. The final sampling suite and limits of detection will be agreed with the EA (and water companies when relevant to their public water supplies).

<sup>2</sup> No detection limit set on basis that water quality meter will measure any potential pH and temperature that could be observed on-site.

<sup>3</sup> As per The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 [6]. Water quality standards to inform Water Environment Regulations assessments are set out in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

- 3.6.4 Groundwater sampling will be carried out in accordance with BS EN ISO 22475-1 or BS ISO 5667-11, as relevant. Samples will be collected using a method appropriate to the data quality objectives, depth to groundwater, well performance, sample requirements and the parameters to be determined. Purging will immediately precede any sampling to enable a representative sample to be obtained of in situ conditions. Groundwater purging volumes and strategies will be in line with those provided in BS ISO 5667-11, unless otherwise agreed with the EA.
- 3.6.5 Following collection, water samples will be placed directly into appropriate clean bottles (as supplied by the appointed laboratory), which are labelled and dispatched to a UKAS ISO 17025 accredited laboratory for analysis within the prescribed analytical holding times, under chilled conditions and accompanied by the relevant chain of custody documentation. Sampling procedures including preservatives and containers for waters will be in line with those in BS ISO 5667-1 and BS ISO 5667-3, unless agreed with stakeholders beforehand. The limits of detection for each determinand are to be lower than the Environmental Quality Standard (EQS), where commercially available, unless agreed with the EA (and water companies when relevant to their public water supplies).
- 3.6.6 Where sampling is undertaken within the Source Protection Zone (SPZ) of a public water supply, the sampling personnel are to adhere to the relevant water companies' standards for training and equipment. Relevant biosecurity measures will also need to be implemented in line with the relevant water companies' INNS plans and INNS Biosecurity Plan (Document reference 7.10, DCO Volume 7).
- 3.6.7 During field sampling, qualitative information such as prevailing weather, pertinent observations (such as standard observations for pollution including oil sheen and turbidity) and geo-referenced photography (where permitted) is also to be recorded during monitoring events to aid interpretation of the monitoring results.

**Table 3-2 Outline water quality sampling suite**

Determinand	Monitoring locations
pH	All
Alkalinity as CaCO <sub>3</sub>	All
Biological Oxygen Demand	All
Chemical Oxygen Demand	All
Specific electrical conductivity	All
Total Dissolved Solids	All
Total Organic Carbon	All
Dissolved Organic Carbon	All
Total Hardness as CaCO <sub>3</sub>	All
Dissolved Oxygen	All
Aluminium	All
Arsenic	All
Barium	All
Beryllium	All
Boron	All

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Determinand	Monitoring locations
Cadmium	All
Calcium	All
Chromium III	All
Chromium VI	All
Copper	All
Iron (total and dissolved)	All
Lead	All
Magnesium	All
Mercury	All
Nickel	All
Potassium	All
Selenium	All
Sodium	All
Vanadium	All
Zinc	All
Ammoniacal Nitrogen (as N)	All
Ammonia	All
Chloride	All
Cyanide (Total and Free)	All
Fluoride	All
Nitrate as NO <sub>3</sub>	All
Nitrite as NO <sub>2</sub>	All
Orthophosphate, reactive as P	All
Sulphide	All
Sulphur as SO <sub>4</sub>	All
Total Petroleum Hydrocarbon Criteria Working Group	All
Phosphorus	Risk dependent
Polycyclic Aromatic Hydrocarbons	Risk dependent
Benzene, Toluene, Ethylbenzene and Xylenes	Risk dependent
Methyl tert-butyl ether	Risk dependent
Phenols	Risk dependent
Volatile Organic Compounds	Risk dependent
Semi-volatile Organic Compounds	Risk dependent
Pesticides	Risk dependent
Herbicides	Risk dependent
Perfluoroalkyl and Polyfluoroalkyl substance	Risk dependent
Bacterial Suite (E. Coli, Total Coliforms, Enterococci)	Risk dependent

## 3.7 Monitoring reporting

- 3.7.1 A reporting programme will be agreed with stakeholders (as per paragraph 3.2.2), together with a reporting format (such as via reports or through stakeholder engagement workshops).
- 3.7.2 The Contractor will collate, review, plot and correlate the monitoring data, as it is obtained. Any erroneous field or laboratory results will be queried with the field teams or laboratory within five working days of receipt.
- 3.7.3 Monitoring data will be reviewed against any predicted impacts identified within the EIA (or subsequent assessments undertaken to support consenting).
- 3.7.4 A database of all water monitoring will be maintained which will include:
1. Raw manual hand dip data
  2. Manual hand dip data plotted in a time series graph
  3. Raw data logger data
  4. Compensated data logger data plotted in a time series graph
  5. Raw in situ water quality data
  6. In situ water quality data plotted in a time series graph
  7. Laboratory certificates
  8. Laboratory analysis screened against EQS
  9. Laboratory analysis plotted in a time series graph
  10. Notes on deviations from the WMP
  11. Calibration certificates
  12. Visual inspection records
  13. Supporting field notes and photos from monitoring visits
- 3.7.5 As a minimum, a water monitoring factual and interpretive report including all the data summarised above will be produced at the end of each monitoring period (pre-construction, construction and post-construction) and made available to relevant stakeholders (as per paragraph 3.2.2).

## 3.8 Asset protection

- 3.8.1 Any site investigations or monitoring boreholes will be protected, as any damage could have a health and safety and/or environmental impact. Any damage is also likely to impact monitoring data availability/continuity and incur a cost to remediate.
- 3.8.2 Site investigation and monitoring boreholes will be suitably labelled so they can be clearly identified and will be identified on the as-built drawings for the Proposed Development.
- 3.8.3 Any site investigation boreholes not to be used for monitoring will be appropriately decommissioned in line with section 4.7, prior to construction starting to reduce the risk of damaging the boreholes.
- 3.8.4 All monitoring installations require two stages of protection, with the level of protection dependent on the location of the boreholes and stage of construction:
1. A barrier:

- a. An appropriate barrier, such as fencing or concrete rings around the site investigation boreholes, will be installed to reduce the risk of accidental damage from plant or machinery during construction. This barrier will be highly visible to plant operating in the area of the boreholes in all weather and lighting conditions.
  - b. In publicly accessible areas, this barrier will also be designed to reduce access to the boreholes (i.e. to reduce the risk of tampering/vandalism).
2. A secure wellhead:
- a. All monitoring boreholes will be installed with a secure lockable wellhead to reduce the risk of contaminants entering the well or damage to transducer equipment.
  - b. Any wellheads that are flush to the ground may need to have their wellhead extended, if located in proximity to construction works, to reduce the risk of any runoff entering the installation. This will be reviewed on a case by case basis and appropriate modifications will be made prior to construction work commencing.
  - c. Boreholes located within SPZ1 will need to be implemented in agreement with the relevant water company and EA, with ultra secure headworks implemented, if required. The wellhead design will vary depending on location, but primary requirement will be for the borehole to be secure from pollution risk (measures may include fencing as well as an alarmed or secured wellhead).
- 3.8.5 In addition to a barrier and a lockable wellhead, any flowing artesian boreholes require that the wellhead is either sufficiently extended above-ground or that it is suitably engineered so that groundwater does not uncontrollably discharge from the borehole.
- 3.8.6 Each monitoring location will be inspected during the scheduled monitoring visits to identify any visible damage, evidence of tampering or uncontrolled discharge from the borehole (such as leaking or overflowing artesian water).
- 3.8.7 Should any borehole or associated infrastructure (e.g. fencing) or equipment (e.g. dataloggers) be damaged, an inspection of the borehole will be undertaken to assess the extent of damage.
- 3.8.8 Following the borehole inspection, the borehole will either be appropriately repaired (if the borehole is still secure, not discharging and able to monitored) or decommissioned.
- 3.8.9 If a monitoring installation is sufficiently damaged that it is unable to continue to be reviewed, an assessment will be undertaken as to the requirement for re-drilling of a new monitoring borehole.

## 4 Monitoring strategy

### 4.1 Pre-construction monitoring

#### Surface water

- 4.1.1 As stated in section 2, the Applicant has undertaken water quality sampling on Hermitage Stream at three survey locations using a YSI multi-probe to take in situ readings of water quality parameters at each survey location. Sampling was completed over twelve rounds between November 2024 and October 2025. The results are presented in Table 19-16 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6).
- 4.1.2 Further monitoring of Hermitage Stream will be undertaken in the pre-construction phase to further characterise baseline water quality. The duration and frequency of monitoring will be agreed with the EA.
- 4.1.3 The Applicant has also monitored the same suite of parameters at three locations on Riders Lane Stream. Sampling was completed over twelve rounds between November 2024 and October 2025. The results are presented in Table 19-19 of ES Chapter 19 Water environment, Volume I (Document reference 6.1, DCO Volume 6).
- 4.1.4 Further monitoring of Riders Lane Stream will continue in the pre-construction phase to further characterise baseline water quality. The duration and frequency of monitoring will be agreed with the EA.
- 4.1.5 Third party data such as EA hydrometric data will be collated monthly (where regularly updated).

#### Groundwater

- 4.1.6 The monitoring locations will be agreed with the EA and the water companies (where relevant to their public water supplies) as part of the detailed WMP, and will provide a broad spatial understanding of groundwater levels and quality across the Proposed Development in different geological strata, with a particular focus on key risk areas (see section 4.3).
- 4.1.7 The locations are anticipated to comprise data collected from site investigation locations installed previously (as part of the design development and EIA process), together with new monitoring locations to be installed and monitoring of third party assets or receptors.
- 4.1.8 An appropriate baseline<sup>4</sup> of hydrogeological data will be collated prior to the main construction works commencing, subject to access agreements. The EA will be consulted if monitoring is not feasible in any locations, such as due to limited access.

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<sup>4</sup> Duration subject to agreement with the EA. The monitoring undertaken to date may be considered a sufficient baseline in some areas, or the pre-construction monitoring duration required could be reduced. A longer duration baseline may be required at higher risk locations (proximal to high value receptors such as public water supplies or designated sites), to be agreed with the EA.

- 4.1.9 Groundwater levels will be collected monthly at each identified monitoring location.
- 4.1.10 Groundwater in situ water quality testing will be collected monthly at each identified monitoring location, at the same time as the manual dips.
- 4.1.11 At locations susceptible to tidal influence or proximal to public water supplies (within SPZ1 or SPZ2), data loggers will be installed to monitor at more frequent one-hour intervals.
- 4.1.12 During the pre-construction period, a minimum of three groundwater samples will be obtained at identified monitoring locations for laboratory analysis. Where results show significant variation, additional samples will be collected.
- 4.1.13 The detailed WMP will also take into consideration available baseline data from the Applicant's operational team and third parties including, but not limited to:
1. Regional EA Groundwater Models.
  2. EA Hydrometric Monitoring Network (rainfall, surface water levels and flows, groundwater levels).
  3. EA water quality network (surface and groundwater).
  4. EA mapping of hydrogeological features/receptors (karst features, springs).
  5. Licensed Abstractions (EA), Private Water Supplies (local planning authority) and Consented Discharges (EA).
  6. British Geological Society (BGS) mapping of hydrogeological features/receptors (karst, springs).
  7. BGS Groundwater Chemistry Reports:
  8. BGS Baseline groundwater chemistry: the Chalk aquifer of Hampshire. [1]
  9. BGS Karst Reports:
  10. BGS Karst Report Series: C5 Karst in the Wessex Chalk (Hampshire and Wiltshire). [2]
  11. BGS Karst Report Series: C7 Karst in the Chalk of the South Downs. [3]
  12. Stantec Natural Cavities Database.
  13. Portsmouth Water abstraction and groundwater level data (where available).
  14. The Applicant's abstraction and groundwater level data (where available).
  15. Ecological data including Priority Habitat, NVC and UKHab data to inform potential GWDTE.
- 4.1.14 Third party data will be collated monthly (where regularly updated).
- 4.1.15 Reduction in monitoring frequency or extents may be feasible in areas, where supported by appropriate evidence that the change will not increase risk to the water environment. Any step down in monitoring will be agreed with the EA (and Portsmouth Water where relevant to their public water supplies), where proposed.
- 4.1.16 The site-wide baseline monitoring plan (including locations and frequencies) will be agreed with the EA and the water companies (where relevant to their public water supplies) prior to commencement, as part of the detailed WMP.

## 4.2 Site-wide construction monitoring

### Groundwater

- 4.2.1 The monitoring locations will be agreed with the EA (and water companies where relevant to their public water supplies) as part of the detailed WMP, and will provide a broad spatial understanding of groundwater levels and quality across the Proposed Development in different geological strata, with a particular focus on key risk areas (see section 4.3).
- 4.2.2 Monitoring will be undertaken throughout the construction programme to ascertain the local and regional hydrological and hydrogeological spatial and temporal behaviour throughout construction. This monitoring will comprise both monitoring from site investigation boreholes installed as part of the Proposed Development, together with collation of third party information for correlation and comparison. It is envisioned that the site-wide monitoring will be broadly in line with the pre-construction monitoring programme.
- 4.2.3 Groundwater levels will be measured monthly at each identified monitoring location. At locations susceptible to tidal influence or proximal to public water supplies, data loggers will be installed to monitor at more frequent one-hour intervals.
- 4.2.4 Groundwater in situ water for quality testing will be collected monthly at each identified monitoring location, at the same time as the manual dips. Dependent on the programme of works, more frequent monitoring may be required.
- 4.2.5 Groundwater samples for laboratory analysis will be obtained at identified monitoring locations at least once every two months.
- 4.2.6 Visual monitoring of any water receptors within the vicinity (100m) of construction activities will be undertaken daily (during working days), with a photographic record and site notes maintained.
- 4.2.7 Any springs (not previously identified) within 100m of active construction activities will be monitored daily; in situ water quality testing and a manual flow measurement (where feasible).
- 4.2.8 Third party data will be collated monthly (where regularly updated).
- 4.2.9 Reduction in monitoring frequency or extents may be feasible in areas, where supported by appropriate evidence that the change will not increase risk to the water environment. Any step down in monitoring will be agreed with the EA, where proposed.
- 4.2.10 The site-wide construction monitoring plan (including locations and frequencies) will be agreed with the EA prior to commencement (and water companies where relevant to their public water supplies) as part of the detailed WMP.

## 4.3 Site specific monitoring

### Chalk

- 4.3.1 During the construction works a watching brief will be employed to detect any unknown karst dissolution features when working directly on/within chalk or where overburden to chalk is anticipated to be less than 10m.
- 4.3.2 Any detection of karst dissolution features during pipeline construction may result in a temporary pause in the works on-site in relevant proximity to the identified feature to allow the Contractor to determine the mitigation that may be required. Mitigation options may include, but are not limited to:
1. The Contractor may determine that the karst dissolution feature is sufficiently filled by low-permeability overburden that it presents little or no risk of acting as a pathway for potential contaminants during construction, and therefore works can continue but a record is maintained of the feature.
  2. Where risk of the karst dissolution feature acting as a pathway for potential contaminants during construction is identified, the Contractor may consider the possibility of altering the course of the pipeline (where technically feasible) within the Limits of Deviation to avoid the dissolution feature.
  3. The karst dissolution feature may be filled with impermeable grout before continuing the works.
- 4.3.3 If any karst features are identified within any SPZ, the EA and relevant operator of the abstraction that the SPZ relates to will be notified if karst is discovered before any further works are undertaken in the area of the karst feature.
- 4.3.4 In all instances, the mitigation employed will be agreed in advance with the relevant stakeholders and the karst feature will be mapped for future reference:
1. Environment Agency (all instances)
  2. Portsmouth Water (within PW SPZ)
  3. The Applicant (within SW SPZ)

### Water Recycling Plant site

- 4.3.5 In addition to the general monitoring during construction, additional monitoring is required during the installation of foundations or shafts in the historical landfill at the Water Recycling Plant (WRP) site. Exact monitoring requirements will be informed by a site-specific foundation/piling works risk assessment which may indicate the need for monitoring requirements in addition to those outlined below. For the avoidance of doubt, the updated foundation works risk assessments will include shafts and any other works which could pose a risk of mobilisation of contaminants.
- 4.3.6 Regular monitoring of both groundwater and surface water receptors (chalk, Hermitage Stream and Langstone Harbour) during piling works will be undertaken to verify that implemented pollution management measures are successful in mitigating impacts on the water quality. The monitoring locations will be agreed with the EA and Portsmouth Water, as part of the detailed WMP.

- 4.3.7 During piling works, daily (during working days) visual observations and in situ readings of selected parameters (pH and conductivity as a minimum) will be undertaken in selected boreholes and surface water monitoring locations. Weekly in situ readings will continue for two months after completion of the piling works.
- 4.3.8 In addition to the in situ monitoring, verification sampling and laboratory analysis from selected groundwater and surface water locations will be undertaken weekly. The results of these analyses will be reviewed against the trigger levels derived for the works (see section 4.6).
- 4.3.9 This data will be reviewed, plotted (with trends over time identified) and correlated weekly during the piling works and for the two months following completion of piling works. The frequency of the quality monitoring will be reviewed monthly with relevant stakeholders during piling (or immediately following a potential pollution incident), to determine if the scope (locations, frequency and suite) needs amending.
- 4.3.10 The WMP will be continuously reviewed in line with the encountered ground and groundwater conditions, with additional monitoring requirements agreed with the EA where:
1. Unforeseen ground or groundwater conditions are encountered, or.
  2. Amber or Red trigger levels thresholds are met (see section 4.6).

#### **Bedhampton and Havant Springs public water supplies**

- 4.3.11 Additional monitoring will be undertaken during works within the SPZ1 of the Portsmouth Water Bedhampton and Havant Springs public water supplies.
- 4.3.12 Site specific monitoring will commence, prior to any subterranean works within the SPZ1. Site specific monitoring requirements will continue for at least two months after works within the SPZ1 have finished (before reverting to regular monitoring intervals).
- 4.3.13 Groundwater levels in the SPZ1 monitoring installations will be recorded by data loggers at one-hour intervals, during works within the SPZ1.
- 4.3.14 Subject to access and security constraints, at least one groundwater monitoring installation within the SPZ1 will be connected to telemetry to allow real-time monitoring of groundwater levels.
- 4.3.15 Daily visual observations and in situ readings of selected parameters (pH, conductivity and turbidity as a minimum) will be undertaken in selected boreholes (agreed with the EA and Portsmouth Water) and surface water monitoring locations during any subterranean works within the SPZ1. Weekly in situ readings will continue for two months after completion of the works within the SPZ1.
- 4.3.16 In addition to the in situ monitoring, verification sampling and laboratory analysis from selected groundwater and surface water locations will be undertaken weekly.
- 4.3.17 Subject to logistical constraints and stakeholder agreement, flow and turbidity monitoring will be implemented at up to four Portsmouth Water spring chambers and the collection chamber outlet recording at one-minute intervals.
- 4.3.18 The flow and turbidity meters will be connected to telemetry to allow real-time monitoring of spring flows and turbidity. Warning systems will be implemented to

enable automatic notification of key personnel (such as via text or email) of any trigger levels being reached (see section 4.6).

- 4.3.19 Portsmouth Water data on spring flows, discharge volumes, turbidity and water quality monitoring will also to be requested at regular intervals, for correlation.
- 4.3.20 This data will be reviewed, plotted (with trends over time identified) and correlated weekly during the SPZ1 works and for the two months following completion of SPZ1 works. The frequency of the quality monitoring will be reviewed and documented every two weeks or following a potential pollution incident, to determine if the scope (locations, frequency and suite) needs amending.
- 4.3.21 The monitoring plan will be continuously reviewed in line with the encountered ground and groundwater conditions, with additional monitoring requirements agreed with the EA and Portsmouth Water where:
1. Unforeseen ground or groundwater conditions are encountered, or
  2. Amber or Red trigger levels thresholds are met (see section 4.6).
- 4.3.22 If there is a system or communications failure of the telemetry, an alert will be issued to the Contractor's primary, secondary and tertiary contacts (as identified in the Communication Plan), together with Portsmouth Water's primary and secondary contacts. It will be agreed with Portsmouth Water whether works can continue, or should be ceased (if safe to do so) until the system or communications failure is resolved.
- 4.3.23 As a maximum, within two hours of system failure, the Contractor (or a suitably competent subcontractor) will check the system on-site and diagnose the reason for failure. This will be further detailed and agreed in the communication plan to be developed with Portsmouth Water.
- 4.3.24 Following the diagnosis, the Contractor will update the Portsmouth Water operational team in writing on the state of the system and a timeline to get the system back online. Construction activities may have to pause until water quality falls below trigger levels agreed with Portsmouth Water for operations to start up again.
- 4.3.25 If the outage were to be medium/long-term, periodic manual sampling will be undertaken in place of the telemetry system, at a frequency agreed with the Portsmouth Water operational team. Alternatively, if operationally acceptable the monitored spring will be isolated until the telemetry system is back online.

### **Riders Lane Stream and Hermitage Stream**

- 4.3.26 During the construction process the pre-construction monitoring in Riders Lane Stream and Hermitage Stream described in section 4.1 will be continued. This will monitor for any impacts as a result of construction activities.

### **Watercourse crossings**

- 4.3.27 At all trenchless crossings of watercourses, additional monitoring is required during trenchless works, and for the construction of drive and reception shafts/pits.
- 4.3.28 Site specific monitoring will commence prior to any subterranean works at the trenchless crossing locations.

- 4.3.29 Targeted surface water monitoring of chalk streams will be undertaken at crossing points at locations and frequencies to be agreed with the EA (and NE where the chalk stream is within a statutory designated site). Use of continuous monitoring sondes upstream and downstream of each crossing (which can be transferred from site to site, subject to biosecurity measures) may be considered.
- 4.3.30 Site specific monitoring requirements will continue for at least two weeks after trenchless works have been completed (before reverting to regular monitoring intervals).
- 4.3.31 Groundwater levels in monitoring installations relevant to the crossings will be recorded by data loggers at one-hour intervals, during the trenchless construction.
- 4.3.32 Daily visual observations and in situ readings of selected parameters (pH, conductivity and turbidity as a minimum) will be undertaken in selected boreholes (agreed with the EA) and at surface water (chalk stream) monitoring locations upstream, adjacent and downstream of the crossing. The daily in situ readings will reduce to weekly after the trenchless crossing is completed.
- 4.3.33 In addition to the in situ monitoring, verification sampling and laboratory analysis from selected groundwater and surface water locations will be undertaken weekly.

#### **Otterbourne public water supply**

- 4.3.34 Additional monitoring is to be undertaken during works within the SPZ1 of the Applicant's Otterbourne public water supply.
- 4.3.35 Site specific monitoring will commence prior to any subterranean works within the SPZ1 and will continue for at least two months after works within the SPZ1 have finished (before reverting to regular monitoring intervals).
- 4.3.36 Groundwater levels in the SPZ1 monitoring installations will be recorded by data loggers at one-hour intervals, during trenchless construction.
- 4.3.37 Subject to access and security constraints, at least one groundwater monitoring installation within the SPZ1 will be connected to telemetry to allow real-time monitoring of groundwater levels.
- 4.3.38 Daily visual observations and in situ readings of selected parameters (pH, conductivity and turbidity as a minimum) will be undertaken in selected boreholes (agreed with the EA) and surface water monitoring locations during any subterranean works within the SPZ1. Weekly in situ readings will continue for two months after completion of the works within the SPZ1.
- 4.3.39 In addition to the in situ monitoring, verification sampling and laboratory analysis from selected groundwater and surface water locations will be undertaken weekly.
- 4.3.40 The Applicant's data on abstraction rates, turbidity and water quality monitoring will be requested by the Contractor at regular intervals.
- 4.3.41 This data will be reviewed, plotted (with trends over time identified) and correlated weekly during the SPZ1 works and for the two months following completion of SPZ1 works. The frequency of the quality monitoring will be reviewed every two weeks or following a potential pollution incident, to determine if the scope (locations, frequency and suite) needs amending.

- 4.3.42 The monitoring plan will be reviewed in line with the encountered ground and groundwater conditions, with additional monitoring requirements agreed with the EA and Otterbourne operational team where:
1. Unforeseen ground or groundwater conditions are encountered, or.
  2. Amber or Red trigger levels thresholds are met.

#### **Licensed abstractions and private water supplies**

- 4.3.43 A register of licensed abstraction and private water supplies within 1km of the Order Limits that may be impacted by proposed construction works will be maintained and reviewed every six months.
- 4.3.44 Where works are proposed within 100m of a licensed or private water supply, a receptor specific water supply risk assessment will be undertaken prior to construction, which will outline mitigation and monitoring requirements.
- 4.3.45 Water supply risk assessments for receptors at further distance may be required on a case-by-case basis.

#### **Groundwater dependent terrestrial ecosystems**

- 4.3.46 A register of all designated GDWTE within 1km of the Order Limits and non-designated GWDTE within 200m of the Order Limits that may be impacted by proposed construction works will be maintained and reviewed every six months.
- 4.3.47 Where a potential reduction in baseflow (as a result of construction activities) for more than two weeks is identified on a non-designated GWDTE, a site specific risk assessment will be undertaken prior to construction, which will outline specific mitigation and monitoring requirements. A site specific risk assessment will be undertaken on any designated GWDTE that is susceptible to a reduction in groundwater baseflow as a result of construction activities. Site specific risk assessments, including mitigation and monitoring requirements, will be agreed with the EA and NE (where relating to a statutory designated site).
- 4.3.48 Subject to access, visual inspection by a suitably qualified ecologist of designated GWDTEs within 1km and non-designated GWDTEs within 200m of active construction will be undertaken twice weekly to identify any observed reduction in saturation or habitat deterioration.

## **4.4 Post-construction monitoring**

### **Groundwater**

- 4.4.1 Post-construction monitoring will be undertaken to ascertain any variation in the local and regional hydrological and hydrogeological behaviour of surface water and groundwater (spatially and temporally). This will help to identify any longer term impacts from the construction activities. The post-construction monitoring will be agreed with the EA and NE (where relating to a statutory designated site), but is envisioned to be for a minimum of one year post-construction, unless agreed with the EA (or other stakeholders as relevant). Longer term monitoring may be required at specific sites (as per abstraction licence or discharge permit requirements), or if anomalous data is observed post-construction.

- 4.4.2 The post-construction monitoring will comprise both site specific monitoring, together with collation of third party information for correlation and comparison. It is envisioned that the site-wide monitoring will be broadly be in line with the pre-construction and site-wide monitoring programme where boreholes are still accessible.
- 4.4.3 Groundwater levels will be collected monthly at each identified monitoring location. At locations susceptible to tidal influence or proximal to public water supplies, data loggers will be installed to monitor at more frequent one-hour intervals.
- 4.4.4 Groundwater in situ water quality testing will be collected monthly at each identified monitoring location, at the same time as the manual dips.
- 4.4.5 Groundwater samples for laboratory analysis will be obtained at identified monitoring locations at least once every two months.
- 4.4.6 Third party data will be collated monthly (where regularly updated).
- 4.4.7 Reduction in monitoring frequency or extent may be feasible in areas across the Order Limits, where data evidences negligible impacts from the Proposed Development, which will be agreed with the EA and NE (at designated GWDTE) where proposed.
- 4.4.8 The post-construction monitoring (including locations and frequencies) will be agreed with the EA and NE (at designated GWDTE) prior to commencement.

### **Surface water**

#### *Havant Thicket Reservoir*

- 4.4.9 Additional monitoring is to be undertaken in watercourses downstream of Havant Thicket Reservoir (Riders Lane Stream and Hermitage Stream) that will receive compensatory flows once the reservoir is operational, both during the 'classic' stage of operation (i.e. the period during which Havant Thicket Reservoir will operate with water from spring and surface sources only, before water from the WRP is added to the reservoir) and once recycled water has been added to the reservoir.
- 4.4.10 In situ surface water quality monitoring will be undertaken at locations and frequencies to be agreed with the EA (utilising existing locations, where feasible).
- 4.4.11 Surface water quality monitoring parameters will be those described in section 2:
1. Basic water quality parameters such as temperature, pH, conductivity, DO, BOD, DOC, alkalinity and turbidity.
  2. Total Phosphorus (TP), phosphate and reactive orthophosphate.
  3. Total Nitrogen (TN), DIN, ammoniacal nitrogen, ammonium, nitrate and nitrite.
- 4.4.12 The final suite of surface water parameters to be monitored will be agreed with the EA.
- 4.4.13 In situ monitoring will be undertaken using a YSI multi-probe (as described in section 4.1) and through laboratory analysis from selected surface water locations. Monitoring will be at a frequency agreed with the EA. The results of these analysis will be reviewed against the trigger levels derived for the work
- 4.4.14 Third party data will be collated monthly (where regularly updated).

- 4.4.15 The monitoring plan will be continuously reviewed in line with surface water quality conditions, with any additional monitoring requirements agreed with the EA where:
1. Unforeseen surface water quality conditions are encountered, or.
  2. Amber or Red trigger levels thresholds are met (see section 4.6).

## 4.5 Monitoring summary

4.5.1 Table 4-1 summarises the monitoring requirements, with the exact durations, locations and frequencies to be agreed with the EA (as well as Portsmouth Water and the Otterbourne operational team where related to public water supplies or NE where related to a designated GWDTE). The table does not include monitoring that is required as part of any abstraction licences or discharge permits.

**Table 4-1 Summary of monitoring requirements**

	Pre-construction	Construction	Post-construction
<b>Duration</b>	Appropriate baseline as agreed with the EA.  Potentially longer at higher risk locations.	Throughout construction	One year after works cease in relevant area.  Potentially longer at higher risk locations.
<b>Locations</b>	Locations TBC with stakeholders.	Locations TBC with stakeholders.	Locations TBC with stakeholders.
<b>Groundwater levels</b>			
Hand Dips	Monthly hand dips	Monthly hand dips	Monthly hand dips
Dataloggers	Collected monthly during hand dips Dataloggers set to one-hour intervals.	Collected monthly during hand dips Dataloggers set to one-hour intervals.  More frequent monitoring at specific locations as outlined in section 4.3. Telemetry systems for real time monitoring at highest risk receptors.	Collected monthly during hand dips Dataloggers set to one-hour intervals.
<b>Groundwater quality</b>			
In situ Testing	As per Table 3-1, recorded during each monitoring visit.	As per Table 3-1, recorded during each monitoring visit.  More frequent monitoring at specific locations as outlined in section 4.3.	As per Table 3-1, recorded during each monitoring visit.  More frequent monitoring at specific locations as outlined in section 4.3.
Laboratory Testing	Minimum of three samples	At least every two months.  More frequent sampling	At least every two months.  More frequent sampling

	Pre-construction	Construction	Post-construction
		at specific locations as outlined in section 4.3.	at specific locations as outlined in section 4.3.
Visual Inspection	During monitoring visits	Daily when working within vicinity (on working days).	During monitoring visits
Dataloggers/ Continuous Sondes	TBC – site specific	TBC – site specific	TBC – site specific
<b>Surface water levels/flows</b>			
Levels	TBC – site specific	TBC – site specific	TBC – site specific
Flows	TBC – site specific	TBC – site specific	TBC – site specific
<b>Surface water quality</b>			
In situ Testing	Monthly water quality sampling on Hermitage Stream and Riders Lane at three survey locations using a YSI multi-probe to take in situ readings.	Monthly water quality sampling on Hermitage Stream and Riders Lane at three survey locations using a YSI multi-probe to take in situ readings.	Anticipated monthly water quality sampling on Hermitage Stream and Riders Lane using a YSI multi-probe to take in situ readings. Final locations and frequencies to be agreed with the relevant stakeholders.
Laboratory Testing	Monthly testing anticipated. Final frequency to be agreed with the EA (and Portsmouth Water where related to their public water supplies or NE where related to a designated GWDTE)	Monthly testing anticipated. Final frequency to be agreed with the EA (and Portsmouth Water where related to their public water supplies or NE where related to a designated GWDTE)	Anticipated monthly water quality sampling and laboratory on Hermitage Stream and Riders Lane. Final locations and frequencies to be agreed with the EA (and Portsmouth Water where related to their public water supplies or NE where related to a designated GWDTE)
Visual Inspection	During monitoring visits	Daily when working within vicinity (on working days).	During monitoring visits.
<b>Third party and the Applicant's operational data</b>			
Met Office	Collate available climate data monthly.	Collate available climate data monthly.	Collate available climate data monthly.
EA	Collate available hydrology and hydrogeology data monthly (where available).	Collate available hydrology and hydrogeology data monthly (where available).	Collate available hydrology and hydrogeology data monthly (where available).
The Applicant	Collate available hydrology and	Collate available hydrology and	Collate available hydrology and

	Pre-construction	Construction	Post-construction
	hydrogeology data monthly (where available).	hydrogeology data monthly (where available).	hydrogeology data monthly (where available).
Portsmouth Water	Collate available hydrology and hydrogeology data monthly (where available).	Collate available hydrology and hydrogeology data monthly (where available).	Collate available hydrology and hydrogeology data monthly (where available).
Other	As required, by water supply risk assessment.	As required, by water supply risk assessment.	As required, by water supply risk assessment.
<b>Other receptors</b>			
Springs	Baseline data collated from third parties.	Daily measurement of spring flow and in situ quality of springs identified within Order Limits, where accessible.	Spring flow and in situ quality of springs identified within Order Limits, where accessible.
Karst	Baseline data collated from third parties.	Watching brief in chalk areas.	N/A (captured during construction works)
<b>Reporting</b>			
Data Review	Monthly	As received	Monthly
Reporting	Method of reporting and programme to be agreed with stakeholders (as per section 3.2.2).		

## 4.6 Trigger levels and action plan

4.6.1 A trigger level system will be implemented, according to a 'traffic light' system (Green, Amber, Red) to provide sufficient early warning should monitoring reveal unexpected changes in groundwater levels, surface water levels/flows or water quality that could impact local receptors.

### Site-wide

4.6.2 For site-wide monitoring, the trigger levels are defined as follows:

#### Green:

1. Monitoring within anticipated range based on pre-construction data (i.e. does not meet amber or red trigger thresholds).

#### Amber:

1. A sustained trend (rise or fall)<sup>5</sup> in groundwater levels that does not correlate with expected<sup>6</sup> behaviour in a single monitoring borehole.

<sup>5</sup> The definition of 'sustained trend' is to be agreed as part of the detailed Water Monitoring Plan, but is considered likely to comprise a statistically significant change over three or more monitoring rounds.

<sup>6</sup> Expected behaviour in this context means behaviour that would be reasonably predictable based on climatic conditions and other monitoring data (boreholes and river levels) within the area.

2. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new substance<sup>7</sup> within the groundwater or surface water quality monitoring, but below EQS (or other agreed red trigger levels).

**Red:**

1. A sustained trend (rise or fall) in groundwater levels that does not correlate with expected behaviour in multiple boreholes.
2. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new substance within the groundwater or surface water quality monitoring, that exceeds EQS (or other standards as agreed with the EA and/or public water supply operators (Portsmouth Water or the Applicant's operational teams) (if relevant)).
3. Detection of a substance (existing or new) above pre-agreed absolute concentration values.

4.6.3 Should an amber or red trigger level threshold be met, an action plan will be implemented. This excludes any water company incident reporting procedures which will also need to be appropriately followed, where appropriate.

**Amber action plan:**

1. Within 24 hours (or the next working day by 11am, if triggered on a weekend or bank holiday), inform the EA that an Amber trigger level has been met.
2. Collate up to date monitoring data, and undertake additional monitoring if there are concerns regarding the validity of the data.
3. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
4. Hold meeting with EA to outline data and suspected causes.
5. Agree requirement for additional mitigation measures or monitoring with EA (e.g. increased frequency of monitoring or review of activities on-site).

**Red action plan:**

1. Stop any construction works that are evidently resulting in a detrimental environmental impact, if safe and practicable to do so.
2. Immediately inform the EA that a red trigger level has been met.<sup>8</sup>
3. Undertake a complete monitoring round in the area of concern and collate up to date monitoring data from others (such as rainfall data).

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<sup>7</sup> 'New substance' in this report means the detection of a monitored determinand which was previously below the limit of detection being monitored above the limit of detection, when excluding anomalous results.

This does not include incidental observations of water quality beyond the confirmed suite. However, any incidental observations should inform future monitoring requirements.

<sup>8</sup> For out-of-hours situations, the EA's Environmental Incident Reporting Service should be used only where monitoring indicates a risk of imminent or significant pollution, particularly to surface waters or designated sites. As part of the detailed water monitoring plan, the communications plan should ascertain when cases require immediate notification via the incident hotline, and cases where standard notification route within the monitoring plan remains appropriate.

4. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
5. Hold meeting with the EA to outline data and suspected causes.
6. Agree requirement to amend any construction activities, implement additional mitigation measures or monitoring with the EA.

### Water Recycling Plant site

4.6.4 For WRP site monitoring, the trigger levels are defined as follows:

#### Green:

1. Monitoring within anticipated range based on pre-construction data (i.e. does not meet amber or red trigger thresholds).

#### Amber:

1. A sustained trend (rise or fall) in groundwater levels that does not correlate with the expected behaviour in a single monitoring borehole.
2. Visual identification of significant turbidity (i.e. water appears cloudy).
3. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new<sup>7</sup> substance within the groundwater or surface water quality monitoring, but below EQS (or other agreed red trigger levels)

#### Red:

1. A sustained trend (rise or fall) in groundwater levels that does not correlate with expected behaviour in multiple boreholes.
2. Visual identification of pollution.
3. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new<sup>7</sup> substance within the groundwater or surface water quality monitoring, that exceeds EQS (or other standards agreed with the EA).
4. Detection of a substance (existing or new) above pre-agreed absolute concentration values.

4.6.5 Should an amber or red trigger level threshold be met, an action plan will be implemented.

#### Amber action plan:

1. Within 24 hours (or the next working day by 11am, if triggered on a weekend or bank holiday ), inform the EA that an Amber trigger level has been met.
2. Collate up to date monitoring data, and undertake additional monitoring if there are concerns regarding the validity of the data.
3. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
4. Hold meeting with the EA to outline data and suspected causes.

5. Agree requirement for additional mitigation measures or monitoring with the EA (e.g. increased frequency of monitoring or review of activities on-site).

**Red action plan:**

1. Stop any construction works that are evidently resulting in a detrimental environmental impact, if safe and practicable to do so.
2. Immediately inform the EA that a red trigger level has been met.
3. Undertake a complete monitoring round in the area of concern and collate up to date monitoring data from others (such as rainfall data).
4. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
5. Hold meeting with the EA to outline data and suspected causes.
6. Agree requirement to amend any construction activities, implement additional mitigation measures or monitoring with the EA.

**Bedhampton and Havant Springs**

- 4.6.6 For the Bedhampton Springs SPZ1 monitoring, the trigger levels are defined as follows:

**Green:**

1. Monitoring within anticipated range based on pre-construction data (i.e. does not meet amber or red trigger thresholds).

**Amber:**

1. A sustained trend (rise or fall) in groundwater levels that does not correlate with the expected behaviour in a single monitoring borehole.
2. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new substance within the groundwater or surface water quality monitoring, but below EQS (or other agreed red trigger levels)
3. Turbidity spike that cannot be reasonably explained by climatic conditions less than 10 NTU (to be agreed with Portsmouth Water) in any of the spring streams.

**Red:**

1. A sustained trend (rise or fall) in spring flows that cannot be reasonably explained by climatic conditions.
2. Turbidity spike that cannot be reasonably explained by climatic conditions more than 10 NTU (to be agreed with Portsmouth Water) in any of the spring streams.
3. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new substance within the groundwater or surface water quality monitoring, that exceeds EQS (or other standards as agreed with the EA and operator).
4. Visual identification of pollution.

5. Detection of a substance (existing or new) above pre-agreed absolute concentration values.

4.6.7 Should an amber or red trigger level threshold be met, an action plan will be implemented, which will be agreed with Portsmouth Water and the EA.

4.6.8 Requirements of the action plans are likely to include:

Amber action plan:

1. Inform Portsmouth Water (within an agreed timeframe) and the EA within 24 hours (or the next working day by 11am, if triggered on a weekend or bank holiday) that an Amber trigger level has been met.
2. Collate up to date monitoring data, and undertake additional monitoring if there are concerns regarding the validity of the data.
3. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
4. Hold meeting with the EA and Portsmouth Water to outline data and suspected causes.
5. Agree requirement for additional mitigation measures or monitoring with the EA and Portsmouth Water (e.g. increased frequency of monitoring or review of activities on-site).
6. Provide Portsmouth Water and the EA with a briefing note summarising the amber incident, together with actions taken and a record of communication between parties. This report will be provided within three working days of the incident and approved by the Contractor.

Red action plan:

1. Stop any construction works that are evidently resulting in a detrimental environmental impact, if safe and practicable to do so.
2. Immediately inform the EA and Portsmouth Water that a red trigger level has been met.
3. Undertake a complete monitoring round in the area of concern and collate up to date monitoring data from others (such as rainfall data).
4. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
5. Hold meeting with the EA and Portsmouth Water to outline data and suspected causes.
6. Agree requirement to amend any construction activities, implement additional mitigation measures or monitoring with the EA and Portsmouth Water.
7. Provide Portsmouth Water and the EA with a briefing note summarising the red incident, together with actions taken and a record of communication between parties. This report will be provided within three working days of the incident and approved by the Contractor.

- 4.6.9 The primary risk to the springs is turbidity spikes during tunnelling/trenchless activities or shaft construction, of which the mitigation actions will be informed by a number of variables including:
1. Portsmouth Water ability to supply customers (i.e. reliance on Bedhampton springs for supply).
  2. Turbidity values.
  3. Whether turbidity spikes are isolated to selected spring streams or all springs.
  4. Duration of any turbidity spikes.
- 4.6.10 It is noted that the karstic springs naturally show turbidity spikes as a result of natural climatic conditions; primarily during the wetter winter months, opposed to the spring sites. During implementation of the secondary mitigation measures, tunnelling may need to cease.
- 4.6.11 A review meeting will be held within one week of the amber or red incident briefing note being shared to assess actions and identify if a change to the trigger levels or action plans are required.

### **Watercourse crossings**

- 4.6.12 For watercourse crossings, the trigger levels are defined as follows:

#### Green:

1. Monitoring within anticipated range based on pre-construction data (i.e. does not meet amber or red trigger thresholds).

#### Amber:

1. A sustained trend (rise or fall) in surface water levels/flows that does not correlate with the expected behaviour (e.g. falling levels when rivers in region generally increasing).
2. Visual identification of significant turbidity (i.e. water appears cloudy).
3. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new substance within the groundwater or surface water quality monitoring, but below EQS (or other agreed red trigger levels)

#### Red:

1. Surface water levels have risen or fallen by more than 0.3m that cannot be reasonably explained by climatic conditions.
  2. Visual identification of pollution.
  3. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new<sup>7</sup> substance within the groundwater or surface water quality monitoring, that exceeds EQS (or other standards agreed with the EA).
  4. Detection of a substance (existing or new) above pre-agreed absolute concentration values.
- 4.6.13 Should an amber or red trigger level threshold be met, an action plan will be implemented.

Amber action plan:

1. Within 24 hours (or the next working day by 11am, if triggered on a weekend or bank holiday), inform the EA that an Amber trigger level has been met.
2. Collate up to date monitoring data, and undertake additional monitoring if there are concerns regarding the data validity.
3. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
4. Hold meeting with the EA to outline data and suspected causes.
5. Agree requirement for additional mitigation measures or monitoring with the EA (e.g. increased frequency of monitoring or review of activities on-site). This may include completing hydromorphological and/or ecological surveys.

Red action plan:

1. Stop any construction works that are evidently resulting in a detrimental environmental impact, if safe and practicable to do so.
2. Immediately inform the EA that a red trigger level has been met.
3. Undertake a complete monitoring round in the area of concern and collate up to date monitoring data from others (such as rainfall data).
4. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
5. Hold meeting with the EA to outline data and suspected causes.
6. Agree requirement to amend any construction activities, implement additional mitigation measures or monitoring with the EA. This may include completing hydromorphological and/or ecological surveys.

**Otterbourne public water supply**

4.6.14 For the Otterbourne SPZ1 monitoring, the trigger levels are defined as follows:

Green:

1. Monitoring within anticipated range based on pre-construction data (i.e. does not meet amber or red trigger thresholds).

Amber:

1. A sustained trend (rise or fall) in groundwater levels or surface water levels/flows that cannot be reasonably explained by climatic conditions and Otterbourne operational activities.
2. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new<sup>7</sup> substance within the groundwater or surface water quality monitoring, but below EQS (or other agreed red trigger levels).
3. Turbidity spike that cannot be reasonably explained by climatic conditions less than 10 NTU in the abstracted groundwater.

Red:

1. A sustained fall in abstraction rates that cannot be reasonably explained by climatic conditions.
  2. Turbidity spike that cannot be reasonably explained by climatic conditions more than 10 NTU in abstracted groundwater.
  3. Detection of a sustained trend (rise or fall) in an existing substance or detection of any new<sup>7</sup> substance within the groundwater or surface water quality monitoring, that exceeds EQS (or other standards as agreed with the EA and the Otterbourne operational team).
  4. Visual identification of pollution.
  5. Detection of a substance (existing or new) above pre-agreed absolute concentration values.
- 4.6.15 Should an amber or red trigger level threshold be met, an action plan will be implemented, which will be agreed with the Otterbourne operational team and the EA.
- 4.6.16 Requirements of the action plans are likely to include:

Amber action plan:

1. Inform the Otterbourne operational team (within an agreed timeframe) and the EA within 24 hours (or the next working day by 11am, if triggered on a weekend or bank holiday) that an Amber trigger level has been met.
2. Collate up to date monitoring data, and undertake additional monitoring if concerns in data validity.
3. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
4. Hold meeting with the Otterbourne operational team and EA to outline data and suspected causes.
5. Agree requirement for additional mitigation measures or monitoring with Otterbourne operational team and EA (e.g. increased frequency of monitoring or review of activities on-site).

Red action plan:

1. Stop any construction works that are evidently resulting in a detrimental environmental impact, if safe and practicable to do so.
2. Immediately inform the Otterbourne operational team and EA that a red trigger level has been met.
3. Undertake a complete monitoring round in the area of concern and collate up to date monitoring data from others (such as rainfall data).
4. Undertake review of data, to ascertain the potential cause of the trigger level being met, and if it could have reasonably been caused as a result of the site works.
5. Hold meeting with the Otterbourne operational team and EA to outline data and suspected causes.

6. Agree requirement to amend any construction activities, implement additional mitigation measures or monitoring with the Otterbourne operational team and EA.
- 4.6.17 The primary risk to the abstractions are turbidity spikes during trenchless activities, of which the mitigation actions will be informed by a number of variables including:
1. The Applicant's ability to supply customers (i.e. reliance on Otterbourne wells or boreholes for supply).
  2. Turbidity values.
  3. Whether turbidity spikes are isolated to selected wells or boreholes, or monitored in all locations where turbidity is being monitored.
  4. Duration of any turbidity spikes.
- 4.6.18 It is noted that the karstic chalk waters naturally show turbidity spikes as a result of natural climatic conditions; primarily during the wetter winter months.
- 4.6.19 Where required, secondary mitigation measures will be implemented in agreement with the Otterbourne operational team and the EA. This may include precautionary implementation of secondary mitigation measures prior to construction, agreed with the Otterbourne operational site team.
- 4.6.20 Where feasible, initial preference will be given to a temporary pause in abstracting from the shallow well systems at Otterbourne which are understood to be more susceptible to turbidity spikes.
- 4.6.21 Where abstractions cannot be temporarily shut down, due to operational requirements, temporary package treatment systems will be implemented, subject to logistical constraints. During implementation of the secondary mitigation measures, construction activities within the SPZ may need to cease.
- 4.6.22 Following completion of trenchless activities the Contractor will provide monitoring data to the Otterbourne operational team to show that no amber thresholds have been exceeded for a minimum of 12 hours. The Otterbourne operational team will subsequently confirm in writing that the abstractions can be put back into supply and action, if required.
- 4.6.23 Following a trigger level exceedance not due to a climatic event, the Contractor will provide the Otterbourne operational team and the EA with a briefing note summarising the amber or red incident, together with actions taken and a record of communication between parties. This report will be provided within three working days of the incident and approved by the Contractor.
- 4.6.24 A review meeting will be held, including the Otterbourne operational team and the EA, within one week of the briefing note being shared to assess actions and identify if a change to the trigger levels or action plans are required.

## 4.7 Borehole decommissioning

- 4.7.1 Improperly decommissioned or abandoned site investigation boreholes can present both a health and safety hazard to people and property and an environmental hazard (through preferential pathways for groundwater or contaminant movement). They can result in mixing of groundwater of variable

quality from different aquifers, contamination of groundwater or contribute to loss of yield and pressure as groundwater flows out.

4.7.2 All site investigation boreholes will be appropriately decommissioned in line with the EAs 'Good practice for decommissioning redundant boreholes and wells' [4].

4.7.3 Agreement will be sought from relevant stakeholders (the EA, Portsmouth Water and Otterbourne operational team) prior to decommissioning of any of the boreholes (to ensure a robust data set has been obtained). A record of all decommissioned boreholes will be maintained, including:

1. The depth and position of each layer of backfilling and sealing materials.
2. The type and quantity of backfilling and sealing materials used.
3. Any changes made to the borehole/well during the abandonment (for example casing removal).
4. Any problems encountered during the abandonment procedure.

## References

- [1] M. E. Stuart and P. L. Smedley, “Baseline groundwater chemistry: the Chalk aquifer of Hampshire (OR/09/052),” British Geological Survey Open Report, Keyworth, 2009.
- [2] L. D. Maurice, E. Mathewson and A. R. Farrant, *Karst Report Series: C5 Karst in the Wessex Chalk (Hampshire and Wiltshire) (OR/22/053)*, British Geological Survey Open Report, 2023.
- [3] L. Maurice, S. Bunting, A. R. Farrant and E. Mathewson, “Karst Report Series: C7 Karst in the Chalk of the South Downs (OR/21/057),” British Geological Survey Open Report, 2022.
- [4] Environment Agency, “Good practice for decommissioning redundant boreholes and wells,” 10 2012. [Online]. Available: [https://webarchive.nationalarchives.gov.uk/ukgwa/20140328084622/http://cdn.environment-agency.gov.uk/LIT\\_6478\\_8cbe6f.pdf](https://webarchive.nationalarchives.gov.uk/ukgwa/20140328084622/http://cdn.environment-agency.gov.uk/LIT_6478_8cbe6f.pdf). [Accessed 09 06 2025].
- [5] UK Parliament, “The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017,” 2022. [Online]. Available: <https://www.legislation.gov.uk/uksi/2017/407/introduction>.

## Annex A Available Groundwater Monitoring Data

Dark Green – Available Datalogger Data

Light Green – Available Manual Hand Dip Data



GI Phase	Borehole ID	2022					2023											2024												
		01-Aug-22	01-Sep-22	01-Oct-22	01-Nov-22	01-Dec-22	01-Jan-23	01-Feb-23	01-Mar-23	01-Apr-23	01-May-23	01-Jun-23	01-Jul-23	01-Aug-23	01-Sep-23	01-Oct-23	01-Nov-23	01-Dec-23	01-Jan-24	01-Feb-24	01-Mar-24	01-Apr-24	01-May-24	01-Jun-24	01-Jul-24	01-Aug-24	01-Sep-24	01-Oct-24	01-Nov-24	01-Dec-24
Phase 2	2L6008DR (1)																													
Phase 2	2L6008DR (2)																													
Phase 2	2L6009DR (1)																													
Phase 2	2L6009DR (2)																													
Phase 2	2L6010DR																													
Phase 2	2L6011SR (1)																													
Phase 2	2L6011SR (2)																													
Phase 2	2L6012SR																													
Phase 2	2M6507SA (1)																													
Phase 2	2M6507SA (2)																													
Phase 2	2M6508SA (1)																													
Phase 2	2M6508SA (2)																													
Phase 3A	BH505																													
Phase 3A	BH506																													
Phase 3A	BH506																													
Phase 3A	BH507-D																													
Phase 3A	BH507-D																													
Phase 3A	BHP01																													
Phase 3A	BHP01																													
Phase 3A	BHP02																													
Phase 3A	BHP02																													
Phase 3A	BHP05																													
Phase 3A	BHP06																													
Phase 3B	3E3019DS																													
Phase 3B	3H4517SA																													
Phase 3B	3J5002SA																													
Phase 3B	3J5004DS																													
Phase 3B	3J5028DS																													
Phase 3B	3K5525DR																													
Phase 3B	3K5606SA																													
Phase 3B	3L6106DS																													
Phase 3C	3E3035DS																													
Phase 3C	3E3115DS																													
Phase 3C	3F3523DR																													
Phase 3C	3F3524DR																													
Phase 3C	3G4022DS																													
Phase 3C	3G4037DS																													
Phase 3C	3G4038DS																													
Phase 3C	3G4102SA																													
Phase 3C	3G4105SA																													
Phase 3C	3G4106SA																													
Phase 3C	3H4600SA																													
Phase 3C	3J5007DS																													
Phase 3C	3J5015SA																													
Phase 3C	3W8529SA																													
Phase 3C	3W8530SA																													
Phase 3C	3W8534DS																													
Phase 3C	3W8535SA																													
Phase 3C	3W8536SA																													
Phase 3C	3W8539DS																													
Phase 3C	3W8553DS																													
Phase 3C	3W8554DS																													
Phase 3C	3W8558SA																													
Phase 3C	3W8567SA																													

Legend	
	Manual Dip Data
	Datalogger Data



from  
Southern  
Water. 

The Southern Water logo graphic consists of three stylized, white, wavy lines that resemble water or a breeze, positioned to the right of the word 'Water'.